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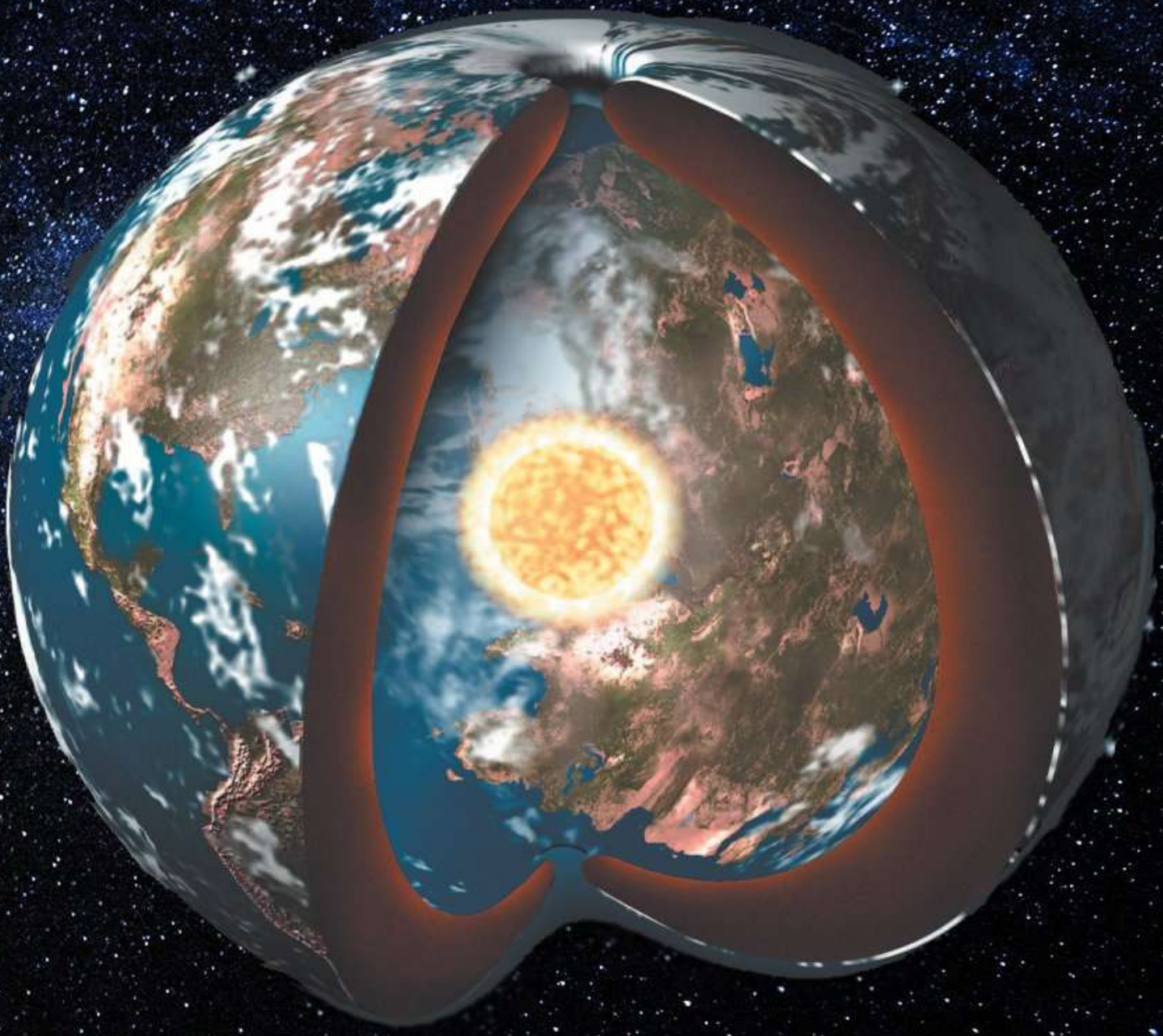
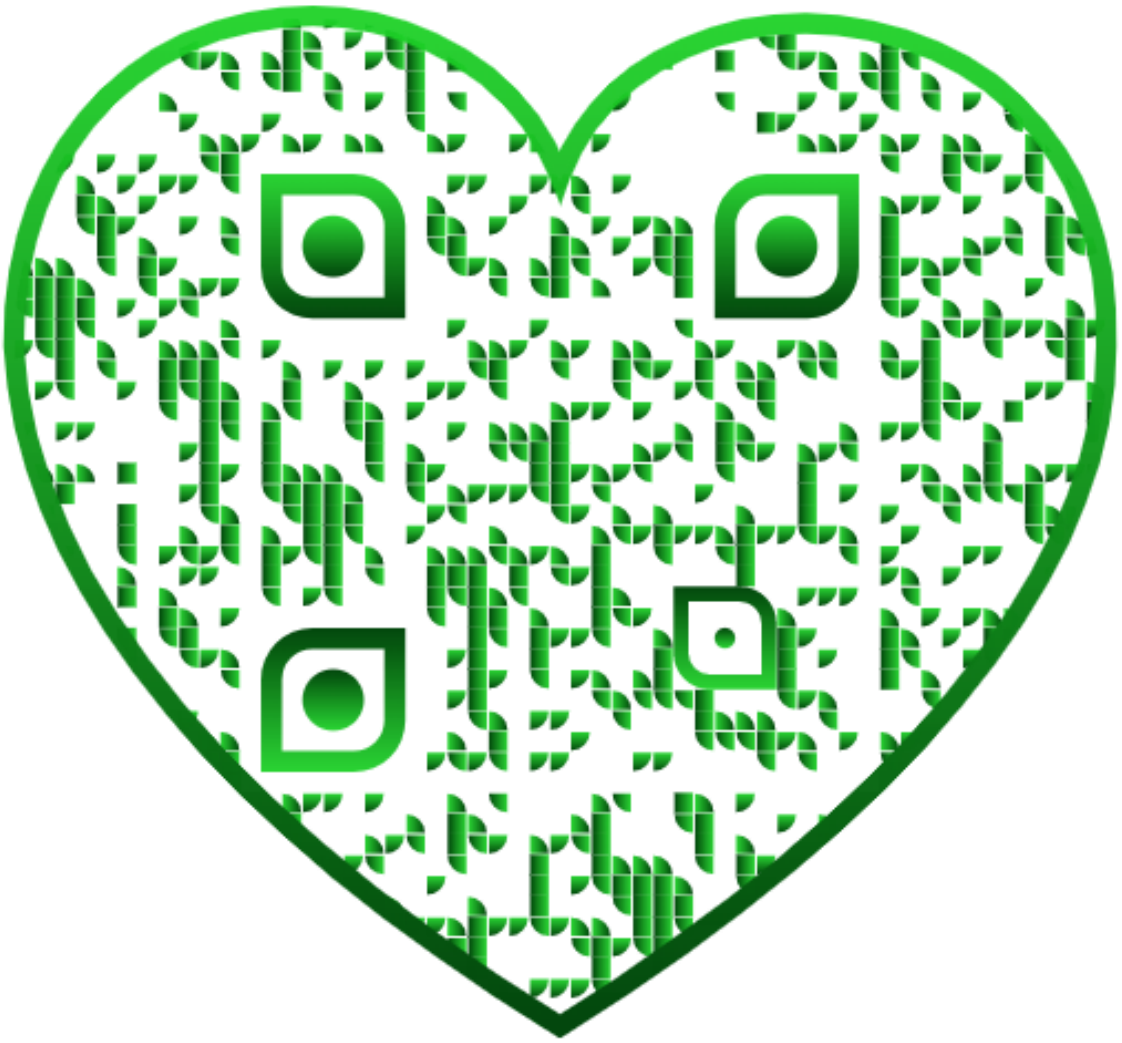
HOLLOW PLANETS

A FEASIBILITY STUDY OF POSSIBLE HOLLOW WORLDS



JAN LAMPRECHT



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Hollow Planets: A Feasibility Study of Possible Hollow Worlds

Grave Distractions Publications
Nashville, Tennessee

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2nd Edition

Mass Market eBook Edition

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Publisher's Note: Bold text within quotations denotes the author's emphasis. Original text emphasis is noted per usual conventions. Other abbreviations and unique conventions to this text maybe found in the Abbreviation section at the end of the text.

Dedicated to

my Mother,

a woman

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without equal

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Other Books and Authors from Grave Distractions Publications You Will Find of Interest

Gloria Amendola

The Tower and the Dream—Awakening to the Call
The Tower and the Land—Awakening to the Light
Mary Magdalene: Revelations From A First Century Avatar, Volume I
Mary Magdalene: Revelations From A First Century Avatar, Volume II
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Alien Scriptures: Extraterrestrials In The Holy Bible
A New World If You Can Take It: Extraterrestrials, and the Evolution Of Human Consciousness

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Astrologia Vedica: A Treatise on the Predictive Astrology of Rishi Parashara
Astro Vedica Series: Stellar Horoscopes
The Beatles and Vedic Astrology
Hollow Earth in the Puranas

Robert Eisenman

The Dead Sea Scrolls and the First Christians
James the Brother of Jesus and the Dead Sea Scrolls I
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Goddess Enchantment, Magic and Spells Vol. 1: Goddesses of Seasons
Goddess Enchantment, Magic and Spells Vol. 2: Goddesses Love, Abundance and Transformation

William Michael Mott

Caverns, Cauldrons, and Concealed Creatures

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Abbreviations

°C: Degrees Celsius

°F: Degrees Fahrenheit

°K: Degrees Kelvin

3D: three-dimensional

AC: Alternating current

Apr: April

arcsec: Arcsecond

Aug: August

BBC: British Broadcasting Corporation

CO_2: Carbon Dioxide

CPT: Captain

COL: Colonel

CQ: A radio short hand code for anyone to respond on a specific frequency

D&D: Dungeons and Dragons

DC: Direct current

Dec: December

DX: Direct exchange during a radio transmission

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et al: And all

Feb: February

ftm: Fathom

gm: Gram

GMT: Greenwich Mean Time

hr: Hour

in: Inch

Jan: January

JPL: Jet Propulsion Laboratory

kg: Kilogram

kHz: Kilohertz

km: Kilometers

lb: Pound

LDE: Long Delayed Radio echo

LT: Lieutenant

LTC: Lieutenant Colonel

m: Meters

Mar: March

mHz: Megahertz

mi: Miles

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min: Minutes

mph: Miles per hour

mps: Miles per second

ms: Millisecond

Mt.: Mount or Mountain

mV: millivolts

NASA: National Aeronautical and Space Administration

nmi: Nautical miles

NOAA: National Oceanic and Atmospheric Administration

Nov: November

Oct: October

Prof.: Professor

SAD: Seasonal Affected Disorder

SAS: Special Air Service

sec: Seconds

Sept: September

St.: Saint

UCLA: University of California at Los Angeles

US(A): United States (of America)

USAF: United States Air Force

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UT: Universal Time

V: Volts

W: Watt

yr: year

Dating conventions are held to the day/month/year format. Times in this text have been converted to a 24-hour system.

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Acknowledgements

I am indebted to so very many people who assisted me in so many ways. I could never list them all as that list would be several pages long. Most of them were ordinary citizens from many countries. Most were Americans, but there were people from Germany, Portugal, Russia, Brazil, South Africa, Canada, Australia and many other countries.

Thank you to the many who offered ideas, constructive criticisms, and also for the support during the many moments of deep depression which assailed me when faced with so many disappointments. Eventually however, the struggle paid off and I think it was well worth it.

Much of the older scientific information in this book comes from the "English Mechanic" which existed earlier this century and which contained very valuable scientific information. It no longer exists in that form and is now owned by "Model Engineer." I would like to thank Model Engineer magazine for their permission to make use of this material.

A special thank you must go to William Corliss for his support, advice and help in undertaking this massive task. William Corliss has spent the last 30 years single handedly constructing the world's only comprehensive catalogue of scientific anomalies. Its scope is amazing. It was absolutely invaluable to me. It seemed logical to test these Hollow Earth ideas against this massive catalogue to see what would transpire. Yes, Mr Corliss, you were right, this is a big job. I learnt a great deal from you. Your Source Book project was of priceless value to me. I cannot recommend it highly enough.

Dr. Lew Gordeev (University of Tuebingen, Germany), and Dr. Mitchell Gohnert (University of the Witwatersrand, Johannesburg) acted as my scientific advisors and were invaluable in this role. They helped to guide me in the right direction in spite of the fact that I am a difficult person to handle!

A special thanks must go to Mr. Remi Du Bois who went to considerable trouble to arrange a meeting with the relevant NASA scientist at Goddard Space Flight Center. Without all the effort made by Remi the ATS III photos would never have made it into this book and perhaps the ATS III photos would have disappeared from public view forever. Remi helped in many areas of research and gave me a great deal of sound advice. His experience as a professional writer helped me a great deal. Remi, thanks for

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letting me lean on you for sound advice on many occasions. I hold your opinions in high regard.

During my research I met with many very kind, courteous and intelligent people who considerably enriched my life and taught me many new things. Those in the list below are mostly scientists whose help was priceless:

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Dr. Tom Van Flandern–Astronomer

Lt Col William Molett–USAF (Ret)

Prof. W. Lehn–Optics

Dale Cruikshank–Astronomer, NASA

Tim Schofield–Scientist, NASA

Locke Stuart–Scientist, NASA

Ron Kotas–Micro-wave Engineer

Prof. Neil Davis–Geophysicist, University of Alaska

Dr. Gawie Notnagel–Nuclear Scientist, South African Atomic Energy Corporation.

Larry Newitt—Geological Survey of Canada. (Mr. Newitt is the scientist who has determined the exact position of the North Magnetic Pole in recent years.)

I communicated with many other scientists, too numerous to mention, from all around the world who patiently answered all manner of difficult questions. I would also like to single out the following associations which helped me a great deal:

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The Frederick Cook Society

British Astronomical Association

A.L.P.O. (Association of Lunar & Planetary Observers) Royal Astronomical Society

Now for the two gentlemen who made this book a reality. Were it not for Robin Forslund of Output Solutions, Ann Arbour, Michigan, U.S.A.; then this book would not be in your hands. Their technical expertise, advice, assistance and kindness made this book a reality.

I can hardly draw a stick figure, so I am terribly grateful to Billy Baty for his graphic artwork, and for obtaining the services of an excellent artist, Butch Travis, who created the cover.

I would also like to thank Dennis Crenshaw and Rodney M. Cluff for their input and thoughts over the years. The same too for my old friend, Gene Du Plantier, in Canada. Thank you for the many news clippings which you sent over the years which helped me so much. Many of them are incorporated into this book.

Finally, thanks to the more than 150 members of my Hollow Worlds List Service, and to Conrad Classen for maintaining it. Many of you deserve mention, and you know who you are. You continuously offered suggestions, advice and support to me during the long, hard years as I worked at this. Most of your criticisms were taken into account and led to a vastly improved product beyond anything I had ever imagined.

Then there’s Jeff Nyquist, a former lecturer at the University of California. You started all this back in December 1993 when you asked me: “Have you ever looked into the Hollow Earth theory?” Yes I have Jeff, and this is my reply to you and everyone else.

To all of you, thank you very much for this wonderful opportunity. I hope you enjoy this book, and I hope that only good comes from our little private, multinational effort.

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Foreword

Round about the accredited and orderly facts of every science there ever floats a sort of dust cloud of exceptional observations, of occurrences minute and irregular and seldom met with, which it always proves more easy to ignore than to attend to. . . anyone will renovate his science who will steadily look after the irregular phenomena. And when the science is renewed, its new formulas often have more of the voice of the exceptions in them than of what were supposed to be the rules. ~ William James

The concept of Hollow Planets may initially sound bizarre, absurd and nothing but absolutely ridiculous. This is a common response as our society and education conditions our thoughts to reject any concepts, theories or postulates that do not fall into mainstream thinking. We are taught that the Earth is solid despite the fact that no one has been able to prove this so called fact. We only have circumstantial evidence that implies, but does not implicitly prove beyond question. Penetrating the crust and the inner cores of the Earth would be conclusive evidence, but the impracticalities of such an endeavor will prevent this unique concept to be resolved and thus remain a mystery.

A Hollow Earth, or Hollow Planets, is by no means an original concept. The earliest recorded research was done by the astronomer Edmund Halley, the same after whom the well known comet was named, who proposed a theory of an Earth composed of multiple shells and a solid center. He presented his theory in 1692 to the Royal Society of London, but he was not taken seriously and consequently the theory never flourished. Later, a mathematician by the name of Leonhard Euler (1707–1783), who is well known to the scientific community for his contributions to physics, mathematics and engineering, also entertained the notion of a Hollow Earth which likewise never generated any interest. Since Euler, the only serious work in this field was done by a manufacturer by the name of Marshall B. Gardner who collated polar and astronomical anomalies suggesting a Hollow Earth. He published his research in 1913 and his collection of theories were similarly classified by the learned as preposterous. Gardner lacked a scientific background which is evident in his writings. For this reason, his proofs were

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weak and therefore the bulk of his work was rejected—often for good reason. In addition, there is a handful of other works, but nothing noteworthy. In the majority of publications, the concept is shrouded in specious stories or folklore which I fear may have caused irrevocable damage to it. Therefore, Jan Lamprecht's book is long overdue. His scientific approach is like a breath of fresh air which will hopefully spur a renewed interest in the subject. His book is not a rehash of previous works, but brings to light new discoveries and knowledge about our Earth and other planets within our solar system which tends to give credence to the concept of Hollow Planets.

Jan Lamprecht's book was never intended to prove the Earth is hollow; that endeavour is beyond the scope of this book. Its intention is to generate thought and to revive interest in an old discarded theory. Scientists may find that a Hollow Earth untangles previous unexplained mysteries such as weather patterns, gravitational anomalies, auroras and seismic patterns—the possibilities are endless. In the end, we may conclude that all planets are solid. However, a multifarious inquiry can only enrich understanding and add knowledge to an inquisitive mind.

As with all unconventional theories, we can only learn and grow from this knowledge if we keep our minds open to the possibility. Success in science not only hinges upon an acquisition of secular skills, but equally important is our ability to be creative. In other words, our openness to new ideas is crucial to go beyond what we already know or think we know. Unless we can prove without doubt, we should always be willing to entertain new or unconventional concepts. The idea of Hollow Planets tests our ability to do so.

Mitchell Gohnert, Ph.D.

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Introduction

The only way of discovering the limits of the possible is to venture a little way beyond them into the impossible. ~ Arthur C. Clarke's Second Law from *Profiles of the Future*

I never had much interest in Greek mythology. At one time in junior school we seemed to spend an interminable time dealing with Greek mythology. It bored me out of my mind. What did I care if the river Hades ran through the Underworld? Where or what was the Underworld anyway? My understanding was that the Underworld was associated with death. This was where you went when you died.

My next encounter with subterranean and hollow worlds occurred as I browsed through a thick book in a public library. Here I saw a photograph taken by the ESSA 7 satellite in the 1960s. This photograph purportedly showed a gigantic opening in the northern hemisphere. The dark region in the photograph was supposed to represent a gigantic hole which led right to the center of the Earth.

So the Earth has a big hole in it! How neat! And with that, I put the book back on the shelf —having lost total interest. Caves, mines, dark places and subterranean worlds just held no fascination for me back then.

It was only some years later when two senior Russian scientists proposed that the Moon was hollow, that I took a serious interest in the subject. These two scientists from the Russian Academy of Sciences had written a paper in the 1970s giving their reasons for considering that the Moon was hollow. An American author, Don Wilson, took the baton and ran with it. The Russians proposed that the Moon had been deliberately hollowed out by some unknown civilization.

I found the reasoning behind the hollow Moon idea quite fascinating. It is the most rational attempt in recent decades at investigating the possibility of Hollow Planets. Why don't people write more about such ideas?, I thought. The Russian hollow Moon idea definitely opened me up to the possibility that other worlds, including the Earth, might perhaps be hollow.

It seems to me that people will discuss anything imaginable, but somehow there is a moratorium on the discussion of hollow worlds. Many

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years later an American friend of mine introduced me to literature which was almost a century old—literature written early in the 20th century which seriously discussed the possibility that worlds might be hollow.

This old literature aroused my curiosity. The final spark which fanned the flame was however when I decided to question an American friend of mine who had held a position as an Auditor in the National Security Agency in the USA. The NSA is America's high-tech spying agency. Much of what they do reads like science fiction. It is only in recent years that the U. S. Government has admitted that the NSA actually exists. My friend had a considerable interest in photography. I mentioned to him some of these old theories which stated that the Earth and other planets might be hollow, and might have gigantic holes in their polar regions. I asked him what he thought. He confessed that he knew nothing about this. What he did do was to relate a story to me. He told me that during the 1970s (round about 1976–77) he had a friend at Goddard Space Flight Center. His friend allowed him to borrow some negatives from Apollo and other space missions. He took these home for the weekend and developed them. He wanted some nice big photographs of the Earth and the Moon. He chose a very large photograph of the Earth to place on his office wall. After my e-mail to him, he looked at this photograph and saw what appeared to him to be a gigantic hole in the Arctic.

Now I was the skeptic. I could hardly believe this. So I asked for a copy of the photograph. He scanned the photograph and e-mailed it to me. And sure enough, there seemed to be something that looked amazingly like a crater. Closer study and thought convinced me that it was created by fog. Nevertheless, it was the strangest photograph I ever saw. It took me a considerable amount of time, money and effort to eventually discover the source of these NASA photographs and to engage in a proper study of them. The results of which are in this book.

By reading all this literature, and looking at this photograph I was now determined to dig into the subject by myself and to draw my own conclusions. I looked everywhere and considered every possibility my mind could entertain. Eventually I decided to write a book to record my thoughts. Perhaps someone will find these ideas to be of interest and use. Scientists have no interest in this type of thinking because as far as they are concerned the Earth and planets are **unquestionably solid**. To them, there is no doubt about this at all. But are they right?

All these ancient myths, religious scriptures, rumors, old evidence,

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strange photographs, etc—aroused my cat-like curiosity. Could the planets possibly be hollow? Most amazing of all, could the very Earth upon which we stand be hollow? Could science have missed some important ingredient? If so, how? Surely, ideas which are 100 or even 200 years old can't possibly be valid anymore? Or can they?

I am a consultant in the computer industry here in Johannesburg. I have spent virtually my entire working life working with computers. I have written programs, designed systems, evaluated software and written papers suggesting conceptual solutions. I am especially proud of my exposure to very complex and very large computer systems, some of the very largest which run in this country.

Analysis is a part of my daily routine. It comes as naturally as breathing does to most people. This does not qualify me as a scientist. I'm far removed from that. Nevertheless, I do have some understanding of logic. Computers only do what they are told. The slightest flaw in one's logic can have great repercussions.

The smallest bug can be a nightmare to detect. It may take days or weeks of the most intensive study and thinking to find it. I am thus well aware of the pitfalls of faulty logic.

Since I am not a scientist, I do not have an "investment" in science. It is therefore easy for me to ask the question: "Could planets be hollow and could science perhaps have missed this in some way?" I have nothing to lose by asking such a question.

It may seem like a ridiculous question to ask. But why not ask it? Children ask all manner of impossible questions and that's how they learn. Why can't an adult entertain a child-like curiosity? I always think of the fairy tale about the emperor who had no clothes. A devious tailor had the emperor walking around stark naked, firmly believing he was wearing clothes. All his unquestioning subjects played along until a child dared to point out that the emperor was indeed naked.

Since no one seemed to be digging into this idea, and since my curiosity was aroused by all manner of strange evidence—I decided to embark on my own assessment of the situation. I decided to test the feasibility of a centuries-old idea by studying the very latest scientific discoveries and evidence.

Since this idea has never gained favor with scientists during the last two centuries it must follow that there can't possibly be much or any evidence in

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favor of it. I expected therefore to dig into science and to come up empty-handed.

At the time that I started my investigation, some Americans informed me that the America Online computer network had had a “folder” dedicated to the “Hollow Earth.” The people who then discussed the subject had concluded that the Earth can’t possibly be hollow and so the folder was shut down!

But how rigorous was their logic? Were they merely accepting the interpretations given to them by scientists? How deep did they really dig?

In searching for bugs in complex computer systems I have learnt to take nothing at face value. I have learned to distrust the testimony and assurances of other people. I have learnt to dig deeply for myself and to do my own thinking. I have found that this is the surest and quickest way of finding the correct answer.

I therefore have something of a built-in skepticism for the pronouncements of others. I like to dig for myself, and to think for myself. Even if I am wrong, I nevertheless find the experience enriching and rewarding. Many lessons are learnt along the way.

Am I qualified to criticize science? Of course not. However, I am a rational being and I am exercising my right to think and to state my own conclusions for those whom it may interest.

I set out to investigate the problem with an open mind. I set out to see if any of this Hollow Planet talk amounted to anything. I knew that Marshall Gardner and William Reed had proposed that the Earth was hollow mostly on the basis of polar expeditions of the 19th century. Did their arguments and evidence hold any water? I was bothered by the narrowness of their investigations. I was determined to cast my net far and wide and to consider the problem from all the angles I could think of.

I set out therefore to dig very deeply, using the latest scientific information, and to assess the arguments of past Hollow Earthers and to also cast an eye upon science. Could an ancient theory actually be workable within the context of modern science? I applied the same rigor to this as I do in my work.

I wondered if science constituted a flawless system? Had anyone ever conducted an audit of it? Did the debits balance with the credits? Was the “system” entirely bug free? Are there contradictions and discrepancies within science perhaps? Would these be able to shed any light on whether planets

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were hollow or not?

Unlike the Hollow Earth theorists of a century ago, I had the Internet at my command. No aspect of terrestrial and planetary science would escape my attention. I went through everything I could lay my hands on. I read every book I could. I tried to familiarize myself with almost every aspect of science which could possibly have any bearing on this idea. I wanted to scrutinize everything.

What did astronomers really see when they looked at other planets? Is it possible for planets to have gigantic holes in them? What did geologists know about the Earth? Or seismologists? Or meteorologists?

Science is so compartmentalized these days that I wondered if the left hand knew what the right hand was up to. Scientists from one discipline merely accept the results from another discipline. They are in no position to challenge it. Then, they have to make square pegs fit into round holes. Being intelligent they are capable of the necessary mental gymnastics to do such things. I was extremely interested in taking a “holistic” approach to things. I wanted to see how well the different disciplines of the “solid Earth” school fitted together.

In digging through the concept of Hollow Planets I wanted to see if the concept was workable from all the different angles. Its failure to do so would spell disaster for it.

In order for a science to work properly there must be no contradictions within it. Things must flow smoothly from one concept to another. The universe, as far as we know, operates very smoothly. It is one enormous integrated puzzle. The science which wishes to describe it must therefore follow a similar pattern. It must have a smooth, integrated look to it.

Many people assisted me in my quest. I gathered together a group of people on Internet and we discussed various ideas and tried to do research. Much of what we discovered is new. This book contains radical new thoughts about old problems. It will also raise new questions and pose new problems never before imagined.

I came upon many fascinating things. Unfortunately, there was just too much to put into one book like this. Originally I set out to assess the viability of Hollow Planets across the Solar System as a whole. I set out to study each planet in turn. I found so many issues however, that I later only concentrated my efforts upon the planets: Mercury, Venus and Earth. All my material for all the planets put together would produce a book much larger than this. The

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problem with research is that it's never-ending. New issues arise all the time.

I hope to eventually produce a second book about the subject, to complete the tour of the solar system. A second book would cover the Moon, Mars, Jupiter, Saturn and other outer planets.

As you read this you may be wondering what possible scientific evidence could support the existence of Hollow Planets? Perhaps you can't conceive of a single logical reason? That's how it is for most people, including scientists. If nothing else, I hope this book will expand your mind and cause you to see old problems from a new angle. If this book stirs your curiosity and your mind I will be content at having achieved something.

What happens when you take science and turn it on its head? Since science is linked together by logic you would think that it would turn into utter chaos and nonsense. But what if you turn science on its head and you find that with some modifications it still makes sense—perhaps even more sense than it did before?

This subject is intellectually dead. I don't expect this book to be the last word on it at all. Indeed, it would be very sad if this were to occur. Instead I hope this book sparks off other books—both for and against the idea. I hope it gets people thinking. Discussion, conducted in a civilized manner, is always a good thing. Even if everyone in the end concludes that worlds can't be hollow, that will be fine. At least the idea will have been put through the intellectual mill—and that's all I ask. I feel that not enough thinking has been done about an idea so important. If planets are hollow it would affect every aspect of our science. Depending on what lies in there it might have effects beyond science—perhaps even economic and political repercussions. Could vast mineral resources lie untapped inside the Earth hundreds or thousands of miles beneath our feet? Could we mine the inside of other planets with ease? Do rare minerals and metals lie on the inner surface of hollow worlds—ready for the picking?

Come with me on a tour through the first three planets of the Solar System. Let me open your mind and show you mysteries beyond anything you have ever conceived possible. No work of science fiction comes even close to this. This idea is more magnificent and fascinating than anything you have ever come across. Perhaps when you have finished reading this book you too might wonder like I do as to whether: Mercury, Venus and Earth may perhaps be hollow? And what lies inside?

Some pretty strange ideas have worked in the past. Some people said

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radio waves would never go beyond the horizon. They said the radio waves would go straight out into space. Then it turned out there was an ionosphere which reflected some of the waves back to Earth and now we have radio stations which can broadcast around the world.

Sometimes off-beat and "fringe" ideas have gone on to become mainstream science. Ironically, these formerly fringe ideas are now thought of as "normal" and anyone who opposes these is spurned as a crank! The irony of it all! An excellent example of this is Alfred Wegner's "Continental Drift" theory. That idea was regarded as the preside of cranks and nutcases for some 60 years. Then in the 1960s new evidence surfaced which suddenly caused scientists to embrace this discredited theory. They now called it "Plate Tectonics" and today it is the reigning paradigm. Woe to anyone who dares insinuate that Plate Tectonics may itself be faulty! Woe to me!

As Dr. Gohnert wrote in the Foreword, one must not underestimate the need for creative thinking, even in science. Humans are by nature, incremental beings. Most of the time we merely modify existing ideas when perhaps what we really need is a radical paradigm shift.

This is best exemplified by the way the ancients dealt with astronomy. The planets seemed to rotate about the Earth. They, quite logically, concluded that the Earth was the center of the universe. The planets seemed to go around the Earth in circles. But the ancients could never explain the minor discrepancies. So they created circles within circles to explain these discrepancies. This system became unwieldy and complex and it still did not explain everything exactly. It took the genius of Copernicus to see the problem from a totally new angle. "Although the idea seemed absurd, I began to think of a motion of the Earth," wrote Nicolas Copernicus. (Carl Sagan, Jonathan Norton Leonard, *et al*; *Planets*, Pg 24, 1972)

Copernicus's "absurd" idea must have seemed truly unbelievable. For at a time when horses were the fastest form of transport it must have seemed incredible that the Earth itself could move at over 60,000 mph without us being aware of its motion. How could such a large object travel so fast? And why did it never collide with anything else?

Exactly the same thing may be happening in science today: small incremental changes when perhaps the evidence is really pointing us to a radical paradigm shift.

Currently when we search for extraterrestrial life we keep looking on the surface of planets. We keep expecting to find life in the same place where we

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are: the surface. But what if there's a whole different dimension to the search for extraterrestrial life? What if we should also be looking deep beneath the surface of planets?

This book alone cannot prove the existence of Hollow Planets. That was not the point or the purpose. I was merely trying to test the feasibility of new ideas and a whole new approach. I do think the results of my research definitely raise enough questions for others to perhaps dig deeper and further into the problem.

In this book I will examine old Hollow Planet ideas which I regard as unworkable or faulty. I question some of the previous Hollow Planet proposals by others. However, I will also highlight problems in modern day science and propose new ideas—truly new ideas which have never before seen the light of day.

I would be most honored if someone in the field of seismology were to test some of the ideas I propose. My proposals in this field are unlike anything ever done in seismology during its entire existence. The thoughts are so radical and so different—yet I have a strong feeling they will work.

In the field of astronomy I have made some suggestions as regards Mercury and Venus. Here too, some interesting evidence may be procured.

The Greek Underworld did not interest me when I was 10 years old—but now I wonder about it a great deal. I ask myself what the origin is of the myths which tell us that the river Hades runs through the Underworld. Where exactly is this Underworld? Do rivers run deep inside the Earth? Can rivers run thousands of miles beneath the Earth's surface? Do rivers run inside Hollow Planets? Many planets once had water. Do rivers run inside hollow Venus, or the hollow Moon? Are there oceans of water inside Mercury or inside Mars near the Martian North Pole? These are serious questions which I am now asking myself.

I am a serious person,and this is a serious book about the strangest idea you'll ever come across. Come with me on a tour of the solar system as you've never seen it before.

Jan Lamprecht
Johannesburg
December 1997

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Part I: Hollow Earth Basics

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Chapter 1: Hollow Planet History

THE ANCIENT GREEKS

The ancient Greeks were an amazing people. Many ideas which we consider to be “modern” originated from them. For example they thought the Earth was a sphere. We credit them with many great things which they did. It has even been said that they predicted the existence of Antarctica. This is partially true. We derived many things from them. It is their science and learning which was their most impressive achievement. But we tend to only look back myopically at the good while overlooking some of their faults.

In this book we will consider the dichotomy between theory and reality. It is taken for granted by many people that reality tends to match scientific theory. But just how close is this fit really? We are now so used to scientists being right that we find it impossible to imagine how they could ever be wrong about the great physical truths of life.

Our civilization today is built upon mathematical science. And much of our mathematics came from those clever Greeks. But the Greeks made their fair share of mistakes too. One aspect of their history which is never pointed out is that their “scientists” came to see the world through glasses which were heavily tinted with their favorite theories. In some aspects their theories were valued more highly than reality. I have wondered to myself for some years whether we aren’t perhaps treading this same path ourselves. We are so used to our theorists being right that we accept their thoughts without question any more.

It has often been joked that when the facts don’t fit the theory one must then discard the facts! Many a true word has been said in jest. There are some theories which we hold as immutable, as fact and beyond question. In this book I will dare to offer suggestions that perhaps some of the facts do not nearly fit our theories as well as we like to think. When you only have one theory it is easy to say the facts fit it well for the simple reason that there is nothing else to compare it to.

The Greek populace, like any population today, harbored their own

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unscientific beliefs and traditions. Their philosophers (“scientists”) did not agree with these views. For example, the general populace believed in a strange country called Hyperborea which existed far to the north. In this mythical land there lived one-legged people.

It is commonly believed that the Greeks lived in a very limited world which consisted only of the Mediterranean region. But this was only true for their “scientists.”

The learned Greek philosophers of the time scoffed at ideas such as Hyperborea on the basis of theory. Climatic theory was among their achievements. They noted that south of them, in North Africa it was very hot, while in the north, in Europe, temperatures were much colder. They concluded that climate was dictated by latitude. Why? They reasoned that temperature was determined by the distance to the Sun. Since they knew the Earth was round, they came to the conclusion that as one travelled further south one was rising and the distance to the Sun was decreasing. As a logical consequence the temperatures in the south must be ever hotter. Similarly, as one travelled further north it should become ever colder. The Greek philosophers then predicted that there were five climatic zones on our spherical Earth. Of these, only two were habitable. They theorized that the far north was too cold to live in, and the same would be true of the distant south. The torrid zone at the equator would be too hot for one to survive in. They went on to predict that the other habitable zone in the southern hemisphere could never be reached because one could never survive the trip across the torrid equatorial zone and its boiling seas.

Among their other theoretical ideas was one which held that there must be a very large land mass in the southern hemisphere which was necessary to “balance” the world. On this basis it has been said the Greek philosophers “predicted” the existence of Antarctica. It is a quaint thought that one of these theoretical ideas should have panned out very possibly due to luck.

The Philosophers said that no one could live up in the far north because it was a torrid zone where life was impossible. The general populace thus believed these far-out nonsensical ideas while their learned philosophers were unable to convince them otherwise. Thousands of years later we do indeed know the truth don’t we? We know that both the general populace and the philosophers were wrong. But who was closer to the truth?

Let us examine the logical content of those theories and try to determine what went wrong. Our knowledge of the Earth’s climate shows us that indeed

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it is hotter at the equator than at higher latitudes. As a general principle the philosophers were right. But the reason they were right was itself faulty. The reason temperature rises as one nears the equator was not because it is closer to the Sun. Sure, the equator is closer to the Sun, but the Sun is so very far away that the few thousand miles that it is closer makes no difference whatsoever. They were right in ascribing the basic cause of climate to the Sun and one's relative position on Earth with respect to the Sun.

Deserts tend to occur in bands across the Earth at similar latitudes but this has to do with the circulation of air and not with the distance of the Sun. North Africa was thus a particularly bad example for them to look at. It does not necessarily become hotter and drier south of the Sahara.

The Greek philosophers made two basic mistakes. One was that they did not know the distance to the Sun and grossly underestimated it. That is quite forgivable. But the really unforgivable error lay in their limited world view. The Philosophers only looked at the limited world around the Mediterranean when they searched for data. Their climate theory was based on a limited subset of all the available data.

But perhaps they could not travel beyond the Mediterranean you might suggest? Not so. In the near east, roughly where Syria is today lived the famous Semitic traders known as the Phoenicians. In the Bible they are referred to as the Canaanites. They lived in several city states, the main ones being Tyre, Sidon, Beirut and Byblos. The Egyptians conquered them in the 16th century BC and in time they were to be ruled by different empires. The Egyptians gave them a considerable amount of independence and it was then that they developed a vast commercial empire which is the basis for their fame.

The Phoenician traders and sailors carried goods from the Near East to Greece, Italy, Spain and the Mediterranean islands. Eventually they dared to sail beyond the Mediterranean to the Cape Verde Islands, the Azores and even to Britain. The backbone of their commerce was gold from Africa, silver from Spain and tin from Cornwall.

The Phoenicians were great manufacturers as well. To further facilitate commerce they set up trading posts. Many of these eventually became great cities like Carthage and Utica in North Africa and Cadiz in Spain.

The Phoenicians were also bearers of culture and helped to speed up the development of backward regions. It is they who first brought the alphabet to the Greeks. There is no question among the historians of today that the

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Phoenicians were the greatest sailors of antiquity.

Yet, in spite of their contributions to Greece and their unmatched seafaring skills the Greek philosophers and scholars considered them to be liars. It is possible the Phoenicians deliberately embellished on their stories so as to protect their sources of tin in England. Nevertheless, the Greek scholars came to review the tales of their travels with derision. Their tales, while fascinating, were thought to have little or no basis in reality.

While the Greek populace believed some of these tales, the philosophers on the other hand regarded them with contempt. Some of these tales told of journeys to lands which lay in the torrid zones. And this, in the minds of these philosophers only served to further confirm that these Phoenicians must in fact be liars. The Philosophers also explained away these tales by assuming that the Phoenicians had over-exaggerated the distances travelled north or south and that they had never reached the torrid zones. By modifying the stories according to their theories, the Greek philosophers were able to convince themselves that indeed there was no credible evidence against their torrid zone theories.

Thus, fact contradicted theory, and that fact was ignored even more so because of its contradiction to the theory of learned men. The crux of it all is that these tales were so utterly wild and so contradictory to carefully calculated theory and logic.

Many tall tales abounded in those times. Tales of men without heads, dog-headed people and many other impossible and marvelous combinations of humans and animals. Those Phoenicians were probably embellishing their tales and making them even more improbable than the truth really was and in doing so these philosophers tended to write all this off as garbage. But in throwing away and ignoring what they regarded as nonsense they were also throwing away something much more precious—the kernel of truth at the center of all these tall tales and rubbish. For among all this nonsense there lay truth. The Phoenicians had indeed been to many distant lands, and they had indeed been to places which Greek theory determined to be uninhabitable.

The history of all cultures in our world is filled with many very wild and improbable tales. Lots of rubbish floats out there and is passed on from one generation to another. It exists in many forms. As folklore, as religion, as tradition and as mythology. Perhaps 99% of it is rubbish, but in and amongst it there may lie truths of enormous consequence. So before we consign it all to the rubbish heap we should perhaps wonder to ourselves if we are going to

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stultify our progress by throwing away a valuable gem which may lie at the center.

One of the wildest claims of the Phoenicians was that they had sailed around the southern tip of “Libya” (Africa). The Greek historian Herodotus tells us that round about 600 BC the Egyptian pharaoh Necho commissioned the sailors of Tyre and Sidon to circumnavigate Africa. The Phoenicians set sail down the Red Sea and returned three years later. Herodotus did not believe their claim. He scornfully wrote “which some may believe, but I do not.” There seems to be reason to believe their claim since they claimed that the Sun was on their right. If their ships were sailing westward and they were indeed south of the Tropic of Capricorn then the Sun would have crossed the sky on their right.[1]

There have been rumours that the Phoenicians made it across the Atlantic as well but these have mostly turned out to be hoaxes. The Greek writer Diodorus Siculus wrote that in the 1st century BC the Phoenicians had discovered an island beyond Africa. This island was said to be “. . . of considerable size, fruitful, much of it mountainous . . . through it flow navigable rivers.” To some this sounds like South America.[2] If the Phoenicians did indeed travel around Africa then they beat that other great sailing nation, the Portuguese, by almost 2,000 years!

What makes the behavior of the Greek philosophers even more damning is when one of their own broke ranks and went in search of the truth. His name was Pytheas. Pytheas claimed to have gone on a voyage to what is now called Britain. He then sailed further north to an island he called Ultima Thule.

Pytheas was considered the champion liar of all antiquity. No man could ever have suffered from a lower reputation than Pytheas did for two thousand years. Pytheas told of how he sailed to Britain. He said that the people there were quite normal (no one-legged folks!). He then sailed further north and saw a strange sludge which floated on the sea (ice?). He reported that on Thule, “The barbarians showed us where the Sun goes to his rest for it happened about these parts that the night was only a little interval after the setting of the Sun before it rose again.” This is a clue that he must indeed have travelled far north in the summer and that nights were short.

Pytheas was reviled by all. The populace did not believe him because his version contradicted their belief in Hyperborea. But, worst of all, the other Greek philosophers rejected his story. They noted that he was normally

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reliable but as regards this trip of his he had suddenly become a teller of tall tales. He could never have gone that far north because it was in a torrid zone and it was far too cold for anyone to survive there. They did not believe any of this nonsense that people could live so far north.

The polar explorer and scientist Vilhjalmur Stefansson presented an eloquent case for Pytheas earlier this century defending him and trying to determine exactly where Pytheas had sailed to. Pytheas may have sailed to either Iceland or the small volcanic Jan Mayen island which lies due north of Britain. Stefansson wrote:

> However, the travel report of Pytheas, and not his scientific work done at home in Massilia, was what the philosophers denounced. Indeed, writers kept exclaiming for twenty centuries how strange it was that a man who had been respected by all who knew him, until he began to travel, should have developed into an egregious liar as soon as his vessels got north beyond the countries familiar to the Mediterranean world.[3]

We now know that Pytheas was the only Greek who engaged in an Arctic expedition in ancient times. We know too that the Greeks would have advanced even more if they had been more open-minded to the information passed on to them by the Phoenicians and if they had listened to one of their own, Pytheas. The opportunities for the advancement of knowledge lay at their fingertips but they were so hide-bound to theory that they let it slip through their fingers.

Strabo is another example of a highly intelligent but narrow scientific mind of his time. He wrote the encyclopedic, *Geography* wherein he dismissed various tales of “men without noses” and battles between cranes and pygmies. While Strabo was logical and careful and dismissed many tales for good reason he nevertheless went on to create new misconceptions based on his scientifically narrow mind. Among the tales he dismissed as fiction was one of “snakes that swallow oxen and stags, horns and all.” The latter seems to be a very valid reference to pythons.

It was Strabo who declared that one could not cross the torrid zones into the other inhabited portions of the world. He set the northern limit of life as being at the latitude of Ireland. As can be imagined, he was no fan of Pytheas. He accused Pytheas of being the “arch falsifier”, such was his belief

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in theory.

Pytheas had made his own errors. He had said that the coastline of Britain was 40,000 stades (4,000 mi) long and that it stretched far north. And he said that further north beyond it he had discovered a new island. This was more accurate than Strabo's assertion that Britain lay to the north-east along the coast of France.

Others, like Crates, who was in charge of the library at Pergamum, was more open-minded and he believed that three quarters of the Earth might be inhabited.

The Greek philosophers were so bound by the self-righteousness of their climatic theories that they just could not accept that they were wrong. They called others liars, and they even castigated one of their own rather than admit that perhaps reality did not match their theory. Their climatic theories seemed so utterly logical and so absolutely correct. But that was only because of their limited data and their limited view of the world. They did not cast their intellectual nets far and wide enough and they wished the contradictions away. Some of our theories today are like that. They seem so perfect, as long as you accept only some of the evidence. But there is evidence out there, scientific evidence, which itself raises serious doubts about our most hallowed theories.

There are quite a few scientists today who are cast in the role of Pytheas. There are a few discontented members of science whose general work cannot be criticized but then suddenly, regarding certain subjects they become "egregious liars" like poor old Pytheas. And who will history prove right?

We can of course ignore this evidence if we want to. Or we could expand our minds and accept that perhaps all is not perfect even within our high science. For as far as we have come there still lies before us an entire universe larger than we can even conceive of and as we journey into it we will make many mistakes along the way. Perhaps if we are open-minded we will not be so blind to our own faults and will correct our mistakes so much more quickly thereby making the journey faster, smoother and easier.

To admit an error is not the same as admitting failure. Failure only occurs when you give up. Making mistakes is a normal part of the learning process. Even our finest scientists can make mistakes. We all do. And it's really no big deal. There's no need to crucify someone for an honest mistake. By deliberately searching out the contradictions and attending to the anomalies one might perhaps get theory and reality back in line so that we

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can progress even faster.

I am going to present to you all manner of data and thoughts from all angles of science. In this book we will examine an idea which on the face of it seems utterly impossible. We will go through this idea in great detail. The one very surprising aspect of this analysis will be that this single idea can solve a great many scientific problems—if only this one idea were true.

The data I will be presenting to you comes from reliable and fully documented sources. This data has been ignored for various reasons. In many cases it was considered that the problem was fully explained. In other cases the problem is regarded as minor, or perhaps it never received adequate publicity. Or, in other cases, the data and its interpretation flies right in the face of some favorite theory or other.

As one looks back at the Greeks the irony of it all strikes one. The very people most suited to finding the truth, the philosophers, not only preferred to castigate one of their own, but they were too lazy or arrogant to do some field work of their own. Modern scientists consider it too demeaning for them to dig through all the modern folklore and religion because it might blemish their scientific reputations. And yet, there is no one better equipped to make sense of it than these very same scientists.

CHRISTOPHER COLUMBUS

A co-worker of mine once told me that the world only advances because of the “unreasonable man.” The reasonable man, so the saying goes, accepts things as they are. The unreasonable man does not, and instead sets out to inflict his thinking upon others. It therefore follows that all progress rests upon the unreasonable man. Christopher Columbus was such a man.

The thinking of the Greek philosophers had so pervaded the Western world that it was still in vogue centuries after they had died. In the 15th century AD the erroneous torrid zone idea was still generally accepted. The Portuguese were the first however to begin disproving it, but it did not go away overnight. It took much more than a single voyage to disprove the notion of boiling seas at the equator.

Columbus sailed a great deal. His journeys southward to the Gold Coast and other places where the Portuguese had been, convinced him that the old torrid zone ideas were in error. He began writing a book to challenge these ideas. In various letters he wrote that he had been to regions considered

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uninhabitable because they were so far south. He now believed the torrid zone ideas were false.

Various historians have disputed another more exciting part of the Columbus tale. His one illegitimate son was to become a man of great repute. At the age of fourteen this son accompanied him on his fourth voyage to the New World. He contended that his father had sailed northwards to Ireland and then on to Iceland in 1476–77 and perhaps even further north of Iceland in Arctic waters to a point much further north than Pytheas had reached.

Historians have disputed Columbus' letter wherein he claimed he had sailed so far north. Columbus noted the extraordinarily high tides in Iceland, which is true. Perhaps the matter has been settled because I noted that the Colliers Encyclopedia entry for Columbus supports the view that Columbus did sail up to Iceland.

With regard to the matter of Iceland, Columbus was also called a liar by many who wished to discredit him. Columbus used the Iceland example to also show that life extended further north than was believed then.

In Iceland it seems Columbus heard of people who lived in Greenland, and the people in Greenland knew of some "islands" (the North American mainland actually) to the south west of Greenland. Columbus therefore had some reason to expect there to be some land further westward. Incidentally, the Catholic Church had knowledge of lands on the other side of the Atlantic because their furthest outpost had been in Greenland since 1124.

Columbus became obsessed with the idea of reaching Asia by sailing westwards. And he made mistakes. He was a great sailor, but some of his own logic and information was faulty. Columbus overestimated the eastward extension of Asia. Many people mistakenly think that Columbus had to try to convince his potential sponsors that the Earth was a sphere. But in fact this was never a part of the debate. It was accepted that the Earth was a globe. The real issue was the size of the Earth and consequently the distance one had to sail to get from Europe to Asia over a vast ocean. Columbus chose an estimate which showed the Earth to be much smaller than it really was. He was therefore able to convince himself that the journey to Asia was really much shorter than it really was. Columbus believed that the distance from the Canary islands to Japan was 2,400 mi. The actual distance by air is 10,600 mi!

When the King John II of Portugal referred Columbus' proposal to his maritime committee it was rejected on the grounds that the distance from

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Europe to Asia was really far greater than Columbus thought it was. The same thing happened in Spain.

But nothing would stop the unreasonable Columbus. He tried unsuccessfully to sell his crazy idea to both the French and the English monarchs. Eventually it was the Spanish who decided to sponsor his crazy scheme. Columbus may have come up with a faulty idea but he will forever be remembered as the discoverer of the New World. By the actions of this one unreasonable man the history of the entire planet was irrevocably changed.

In the final analysis those scholars were actually right about the size of the Earth and the distance to Asia. And Columbus never did reach Asia even though he stubbornly refused to believe it. But it is Columbus who became the legend and not them. Columbus seemed to have done his own thinking. Some of it was right and a lot of it was wrong. But he had vision. He later wrote gratefully to Ferdinand and Isabella: “Fill’d with this desire [to explore], I came to your Highnesses. All that heard of my undertaking rejected it with contempt and scorn.”[4]

Columbus’ great, and unacknowledged contribution to science was in helping to lay to rest, by practical example, the erroneous Greek climatic theories. His voyage to Iceland and beyond instilled the lure of Arctic exploration in him. Whether this was in some way linked to his interest in the Hyperboreans is unknown. He became convinced that one might be able to reach the North Pole by sea. He made plans to sail up to the North Pole but never got around to it because his voyages to the New World consumed so much of his life. We will meet up with Columbus again later when we examine Arctic exploration.

SUBTERRANEAN WORLDS

I have come to wonder if there may be a grain of truth in the many wild stories and myths of the world. The key is to then discover this grain of truth which lies buried in the muck. This grain of truth may then help to spur us forward. There lies a vast literature of folklore, mythology and religious texts across the world. Most of it may be false, but deep inside it may be valuable grains of truth which may help us to unlock the secrets of the universe.

In recent centuries science has become ever more skeptical of the validity of the ideas of our forefathers. Scientists have come to ignore more

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and more of our past. We look upon our forefathers as being basically unreliable in all things. But perhaps we are being overly critical of them. Religion is seen in Leninist terms as the “Opium of the masses.” But perhaps, there is truth underlying some of this religion.

All religions are different and their intolerance of one another has led to many wars. They have different traditions. The mumbo-jumbo aspects of religion vary considerably. The way they worship and pray may differ vastly. But underneath it all there seems to lie a simple common thread. Once the mumbo-jumbo is stripped away there may be much which they have in common. The same is true of all manner of folklore and mythology.

Not long ago, scientists staked their reputations on the fact that stones do not fall from the sky. We now call them meteors. And we know that very large ones can fall and can probably kill us all. We know why they fall from the sky too, and it is no longer a mystery.

If you think there is no mystery left in the world then perhaps you are brain-dead or arrogant or both. There are many mysteries left. Unanswered, partially answered, badly answered and expediently answered questions abound for those with the eyes to see them.

I have read many strange stories which seem to have a common thread in them and which hint at the existence of other life on this Earth besides us. This life, so it is hinted lies deep underground.

Our modern science has replaced the outdated torrid zones of the Greeks with new ones. The new torrid zones lie deep beneath the surface of planets. In this new torrid zone the temperatures and pressures have been calculated by mathematical formulae alone. Our knowledge of the deep interior of planets is every bit as theoretical as that of Greek climatic theory. Where is the modern Columbus who will prove it wrong?

But what of seismology you may exclaim? We know where seismic waves have gone and using them we know with absolute certainty of what lies at the core of the Earth. Not so. Our knowledge of where seismic waves have gone is derived from the same mathematical formulae we used to calculate those temperatures and pressures in the first place. It is all intertwined. The one is in no way an independent confirmation of the other since both are derived from the same root.

The deepest mines in the world are here near where I live. No miner has told me of encounters with people underground. And the temperatures and pressures in mines make it seem impossible for anyone to be living down

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there. But what if such life were to exist much deeper in the hot torrid zones of modern science in the very place the “philosophers” of today say that life cannot exist? We have only scraped the surface of our world. A 6 mile deep mine hardly amounts to a pin-prick on a planet with a radius of 3,963 mi. We have virtually no knowledge of what conditions are like 50 mi or more down. Could it be that there is some essential concept we may be missing?

In poring over all manner of current and ancient mythology, I have gradually begun wondering about the state of this solar system in which we live. The more I thought about it the more it seemed that we are ignoring something crucial. By overlooking it we are placing ourselves in the position of those philosophers. The more we hear stories which do not match our paradigms the more we ignore them. The one unifying concept which comes to mind time and again seems to be this crazy old idea that worlds may be hollow. So very much could be explained if only this were to be true.

Could planets be hollow? Could subterranean worlds of caverns and tunnels be a reality not only on this world but perhaps on others? If so, how do we reconcile that with scientific reality? At what point is the one idea right and the other wrong? And why?

Lord Cavendish conducted an experiment in 1798 to determine the mass of the Earth based on Newton’s law of gravity. Cavendish’s results would later result in scientific models of the Earth which would have matter compacted with densities of up to ten times that of water. This means that there cannot be any cavities, tunnels and hollows deep inside the Earth.

Many traditions from all over the world hold that there is life within the Earth—perhaps very deep within this world. Some Christians once thought that Hell existed deep inside the Earth. It was a logical location for the great fires which were there for the punishment of sinners. There probably are still people who believe exactly that. Tales have been told of strange people and creatures coming out from tunnels in the Earth. And on occasion incredible tales have been told purporting that someone from our civilization travelled into the Earth and happened upon someone else living there. Most of it is nonsense but I have wondered to myself if there could be a kernel of truth behind all this?

Our diverse and austere religions, normally run by men of integrity and high morality also have traditions which point to the existence of life within our planet. The Hindu and Buddhist religions have the most developed underworlds. The Greeks also believed in an underworld.

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We will return to the religions and folklore much later in this book when we discuss the possible locations of this world and how to get there. Instead we will turn our attention to some of the great scientists who were responsible for the science we have today. Some of them were wide-ranging thinkers and they too had thoughts that perhaps our world could be hollow.

Let it be said that many of the great minds who fathered today's Western science were themselves men of religion. It could be that they were more open-minded than we are today. For centuries there has been bickering between religion and science. What if one could reach a point of convergence?

Sir Isaac Newton, the father of gravity and calculus, spent a considerable part of his life attempting to crack the secret code which he believed lay at the heart of the Bible. Leonhard Euler, the greatest mathematician of all time, whom we shall be discussing in detail, was also a religious man, as was the father of Hollow Earth theory in the Western world: Sir Edmund Halley. We are keeping good company in having an open-mind to these things because these great people of the past were similarly inclined.

SIR EDMUND HALLEY (1656–1742)

There is no comet more famous than Halley's comet. But few know that the great astronomer who discovered this comet also first proposed that the Earth was hollow. His proposal was that several Hollow Planets existed inside each other something like a Russian doll.

Halley's father was a rich man, and he sent his only son to St. Paul's School. At school he distinguished himself in the classics and at mathematics. He entered Queen's College, Oxford in 1673 with a competent knowledge of Greek, Latin and Hebrew. Before graduating, he had already undertaken a considerable study of the skies. With a 24 ft long telescope he observed a lunar eclipse in 1675. Before the age of twenty he had communicated to the Royal Society a *Direct and Geometrical Method of finding the Aphelia and Eccentricity of the Planets.*

He graduated from university in 1676. Shortly thereafter he sailed to the island of St Helena where he set up instruments to observe the southern sky. He drew up the first catalogue of stars made with a telescope. In the course of his voyage he improved the sextant and noted the equatorial retardation of the pendulum. It was also here that he made the first complete observation of a

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transit of Mercury.

By the age of 22 he was already one of the most noted astronomers of his time. In 1703 he became a professor of geometry at Oxford University and in 1720 he became the Astronomer Royal. Halley was also the first to prove that stars were not stationary. He showed that they had moved since Ptolemy's time.

Halley's father died, and the wealth which had helped him now disappeared and he was left a poor man. He was the driving force behind what is now called Newtonian gravity. He had always been aware of the importance of the problem of gravity. In January 1684, using Kepler's third law, he had deduced the law of inverse squares which was to be the core of Newtonian gravity. Halley did not however make the final mathematical breakthrough. A. H. Cook from the Cavendish Laboratory at Cambridge, England tells us:

> It was first realized by Edmond Halley in the 1680s that Kepler's laws of planetary motion implied the force that attracted a planet or satellite to the focus of the ellipse in which it moved was proportional to the inverse square of the distance from the focus; only Newton was able to show that motion under an inverse square law of attraction would be in an ellipse or parabola.[5]

Newton's achievement was the mathematical proof that the inverse square law resulted in an elliptical orbit.

In an address delivered at Cambridge on 19 Apr 1888, Dr. Glaisher expressed the conviction that "but for Halley . . . [Newton's] *Principia* would not have existed." His suggestions originated it; he averted the threatened suppression of the third book. He paid all the expenses, he corrected the proofs, he laid aside all his own work in order to press forward to the utmost the printing. All his letters show the most intensive devotion to the work. He undertook to print Newton's work at his own cost. His outlay was eventually reimbursed by the sale of copies. *A Discourse concerning Gravity* was read by Halley before the Royal Society in April 1686.

Halley later became the editor of the *Philosophical Transactions*. He contributed many papers of his own. His ideas covered many earthly subjects too. He proposed a circulatory theory of winds. He even tried to calculate the age of the Earth by studying the rate of salt accumulation in the oceans. This

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angered a number of bishops because he concluded that the Earth was much older than they said it was. He suggested that a comet might have caused the Biblical flood. This type of thinking was echoed by Velikovsky earlier in our century. The effects of comet and asteroid strikes on Earth are now a fundamental aspect of science.

Halley was incredibly energetic throughout his life. He engaged in the translation of a book from Arabic into Latin, and aided engineers in the fortification of Trieste. He even managed to obtain the command of a war sloop from William III in 1698 with orders to study the variation of the compass and to attempt to discover new land to the south of the 'western ocean.' He penetrated to a latitude of 52° south where he "fell in with great islands of ice, of so incredible a height and magnitude that I scarce dare write my thoughts of it." On the King's orders, Halley made a thorough survey of the tides and coasts of the English Channel. One of his admirers was Peter the Great. He divined and demonstrated in 1686 the law connecting elevation in the atmosphere with its density. He made improvements to diving apparatus and even made a descent in a diving bell. He was a master of statistics and compiled the *Breslau Table of Mortality* thereby ranking him as the originator of actuarial science on which the life insurance industry is based! He solved various mathematical problems, and his contributions to pure geometry alone are regarded as enough to secure him a distinguished place in scientific history.

Halley's interest in comets led to his writing the *Synopsis of Cometary Astronomy*. This work contained the calculated orbits of twenty four comets. He found that three of these were so similar that he concluded that the comets of 1531, 1607 and 1682 were in fact the same. Having determined that this comet had a period of seventy six years he predicted its return in 1758. He appealed to "candid posterity to acknowledge that this was first discovered by an Englishman." In due course it reappeared on Christmas day in 1758, long after his death, and it has been known as Halley's comet ever since. Lalande regarded Halley as "the greatest of English astronomers." By common consent he was regarded as Newton's equal.[6]

Halley's most controversial theory originated from his study of magnetism. It seems to me as if Halley is truly the originator of the idea that planets might be hollow. It is important therefore to understand what caused him to engage in this line of thinking.

Halley realized that the magnetic poles were constantly moving. He

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believed this could be explained by having two fixed magnetic poles (north and south) in the crust of a Hollow Earth, and two more inside which were moving. He envisaged hollow spheres, one inside the other, rotating at slightly different speeds. One of these inner shells would contain the other set of magnetic poles. If that shell rotated slightly slower than the outermost shell then that might account for the apparent motion of two of the magnetic poles while the other two stood still. The *Dictionary of National Biography* states:

> His theory of the variation of the compass was proposed in 1683, and further developed in 1692. **It assumed the direction of the needle to be governed by the influence of four magnetic poles**, **two fixed in the outer shell of the Earth**, **two revolving with an inner nucleus in a period roughly estimated at seven hundred years**. **This hypothesis explained with surprising success the 'Abstruse Mystery' of secular magnetic changes**. **It was revived by Hansteen in 1819**.

Halley's theory of concentric spheres was presented to the Royal Society in 1692. He proposed that the Earth is a hollow shell approximately 500 mi thick which contains three smaller spheres with diameters approximately equal to that of Venus, Mars and Mercury. Each sphere was separated from the others by about 500 mi of atmosphere. As has been shown, Halley was definitely not ignorant about the effects of gravity and was a prime mover who helped bring the theory into existence. Surprisingly he proposed that these shells were prevented from colliding with each other because gravity held them in place. This is surprising because gravity on the inside of a hollow shell is zero. Halley believed that all four spheres rotated about a common axis. The smallest of the spheres however was believed to form a hot, solid core. It is important to note that in its original form, Halley's shells had no holes or openings in them at all.[7] You could not tell from the outside that the planet was hollow.

Halley then began speculating on whether there might be life inside these shells. Halley's reasoning was that since God had created "animate beings" which inhabited every part of the Earth as we know it, why should He not therefore have also caused the interior of these shells to be habited? The first objection to this idea was that there would be no light inside such a sphere. Halley countered by suggesting that ". . . there are many ways of producing Light which we are wholly ignorant of." He suggested that the

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atmosphere might be luminous, or the inner sides of the spheres might emit light, or there might even be small Suns inside the Earth which he referred to as: “peculiar Luminaries below, of which we have no sort of Idea.” Many of the core features of the Hollow Earth theory were born out of Halley’s speculations.

Recently, Walter Kafton–Minkel wrote a book called *Subterranean Worlds*, where-in he examines the history of the Hollow Earth theory, and the tales of subterranean life. He did a great job of compiling a detailed history where none had existed before. He does not support the idea at all. Kafton–Minkel’s job is thorough and it lists all the liars and charlatans who used this subject for self-gain. I have no problem with the exposition of liars, but we are here to examine the scientific content of the idea and are therefore only interested in those who advanced the idea on a supposedly scientific basis. Kafton–Minkel serves as something of a hostile witness since he is out to denounce all advocates of the idea, including scientists like Halley. Kafton–Minkel writes:

> Halley’s article attracted a great deal of attention and was reprinted several times, not only in abridged editions of the *Philosophical Transactions*, but also in a special volume of the Royal Society’s ‘most valuable’ discourses.

We are told that a few scientists of his time did take the idea seriously. The vast majority however did not know what to make of this bizarre idea, and tended to ignore it. All scientists welcomed his tables of magnetic variations, but only a few took his explanation for it seriously. The very accomplished French scientific community laughed at Halley’s theory. But Halley defended his theory and gathered more data.[8]

Halley’s theory underwent a further modification when the great aurora of 1715 appeared. The Royal Society had asked Halley to write a description of the aurora. Halley took this opportunity to try to explain the underlying cause of the phenomenon. Newton had speculated that the Earth might have an equatorial bulge and be flattened at the poles. Halley now modified his idea by suggesting that the thinnest part of the planet’s crust was at the poles. He suggested that maybe some of the luminous atmosphere which lights the inner shells was managing to escape, and was being controlled by the Earth’s magnetic field thereby producing the aurora. The *Dictionary of National*

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Biography states:

> The great aurora of 16 Mar 1715, the first he had seen, was observed by him at London. He explained the auroral crown as an optical effect due to the ‘concourse’ of many streamers, and suggested a mode of determining the height of such phenomena. **The hypothesis of their magnetic origin was a development of his views on terrestrial magnetism**. **He supposed aurorae to be occasioned by the escape of a ‘luminous medium’ by which a subterranean globe was rendered habitable**.[9]

We must not lose sight of the fact that Halley’s peculiar theory was surprisingly accurate in its ability to explain the many problems of terrestrial magnetism and that Hansteen tried to revive it a century later. That might explain why a few scientists were willing to consider it, in spite of its very bizarre nature.

Many people have laughed at Halley for his strange theory. Such criticisms come from unimaginative conformist sheep who do not appreciate the creative thinking which is needed to come up with original solutions to difficult problems. I think Halley did very well. His ideas were fresh and original and he tried to solve many problems. It is also silly to expect someone to come up with the complete answer to such a complex problem on his first attempt. Theories need input and constructive criticism from others. As we will see, Halley’s initial idea was indeed criticized and modified, and this resulted in a much more workable theory. However, it would be stupid to deny his initial contributions to this subject. Considering all he achieved, he must surely be the greatest English astronomer of all time.

LEONHARD EULER (1707–1783)

Leonhard Euler was a great Swiss mathematician. He was a student of the great Jean Bernoulli, and became the most prolific writer on mathematical subjects of all time. At the age of twenty, he was invited by Catherine I to the newly founded Academy of Sciences in St. Petersburg. He became a professor of physics three years later and of mathematics in 1733. In 1738 he lost the sight of one eye. In 1741, by invitation and command of Frederick the Great, he moved to Berlin to become the director of mathematics and physics in the Berlin Academy of Sciences. Here, for the next 25 years, he

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produced innumerable treatises covering essentially the entire field of pure and applied mathematics. In 1766 Euler returned to Russia at the invitation of Catherine the Great. Soon after his arrival in St. Petersburg, he became completely blind as the result of a cataract, but his facility in mental computation and his remarkable memory allowed him to continue to work energetically during the remaining seventeen years of his life. While blind, he would nevertheless dictate to others who wrote his thoughts down. His mental faculties were incredible and he performed the most amazing calculations in his head during this time. He is without equal in the use of algorithms to solve problems.

Euler's writings indicate the unusual versatility of his intellect. His *Letters to a German Princess* (*Lettres a une princess d'Allemegne sur divers sujets de physique & de philosophie*) (1768) was very popular. It was translated into many languages, including Russian, German, Dutch, Swedish, Italian, Danish, Spanish and English. The English versions have gone by different titles, the most common being either *Letters to a German Princess* or *Letters of Euler on Natural Philosophy*. Between 1768 and 1904, it appeared and reappeared in numerous editions in different languages.

His interest in improving eyeglass lenses resulted in the treatise *Sur la Perfection des Verres Object Lunettes* (1747), a work which contributed to the discovery of achromatic telescopes. He is best known, however, for his work in the field of pure mathematics. He is responsible for the common use of the symbols e, π and i. He improved the integral and differential calculus. His complete text surpassed anything then extant on the subject. His *Introductio in analysin infinitorum* (1748), did for modern analysis what the *Elements* of Euclid did for ancient geometry, and it is considered his greatest production.

During the almost sixty years of his scientific study, his tireless genius produced 32 books in Latin, German, and French (many in more than one volume) and nearly 700 treatises in French and Latin.

Many of the basic formulae used in the field of engineering today were developed by Euler. In engineering, Euler is as prominent as Newton is in physics. One of the leading experts on Euler was Prof. Clifford Truesdell at Johns Hopkins University, USA. He once wrote:

> Only ignorance or special pleading can deny Euler his rightful place as the greatest mathematician of all time." There is a general consensus

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> among academics that Euler is indeed the greatest mathematician of all time.

Dr. Gordeev was the first to tell me of Leonhard Euler's possible interest in the Hollow Earth. At the time however, I was ignorant of his reputation and the awe in which he was held by mathematicians and engineers alike. This was later explained to me by Dr. Gohnert.

Kafton–Minkel, who is no friend of the Hollow Earth idea, informs us that Leonhard Euler proposed his Hollow Earth theory approximately seventy five years after Halley's original paper. He tells us that Euler's globe was:

> . . .simply a great hollow bubble. But it was not empty, for in its center he placed a small molten core that served, for this inner world's hypothetical inhabitants, like a miniature Sun, eternally at the zenith of the interior 'sky'.[10]

Mysteries of Mind, Space & Time also states: "Leonard Euler, an 18th century mathematical genius, **deduced that the Earth was hollow**, **contained a central Sun and was inhabited** . . . "[11]

Amazingly enough, not all Euler's works have been translated into English yet. Most of his writings are in Latin and a lesser amount was in French and German. The translation of his works into English is an ongoing project. Dr. Gohnert, Dr. Gordeev and I tried to get more information about Euler from many sources to determine his thoughts on gravity and the Hollow Earth. All the American, German and Swiss experts on Euler we contacted told us that Euler never wrote anything about such a subject.

Since Dr. Gordeev is a mathematician, he was also curious about Euler's thoughts. He tried to use the excellent facilities at the University of Tuebingen in Germany where he works to see if he could find something more. As Dr. Gordeev is fluent in French, German, Russian and Latin he had no problem reading any texts, but he could not find anything written in Euler's own words.

He informed me that even if he spent two hours a day searching through Euler's writings it would still take several years to go through all of it. A further problem is that there is no complete index of everything he wrote. His complete scientific writings in Latin take up a staggering 73 volumes. The best index available is one which was drawn up in German in 1910. A search

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of that does not reveal anything about the Hollow Earth either. This does not mean that Euler never wrote anything about the Hollow Earth. Dr. Gordeev told me that Euler's writings are voluminous, and many of his letters are still in Russia and have never been published. Could it be that Euler's musings are there among the letters in St. Petersburg? The excerpts I saw from the German index also did not seem to be that detailed.

Dr. Gordeev mentioned that Euler had criticized Halley's concentric spheres theory. I asked him if he had more information about this. In an e-mail dated 18 Feb 1998, Dr. Gordeev wrote:

> "Yes, I read this somewhere, but haven't seen Euler's words with my own eyes. For example, a similar statement can be seen in the Time–Life volume of 1987."[12]

I found an Internet web site called the "Unnatural Museum" run by Lee Krystek. It had a section which dealt with Hollow Earth theories of the past. Lee had also come across various second-hand references which stated that Euler had proposed that the Earth was hollow. Lee drew a diagram of the Hollow Earth based on what are believed to be Leonhard Euler's ideas. It consisted of a single hollow shell with two Polar Holes. In the middle there was an enormous molten-core "Sun" 600 mi in diameter. Lee had a reference to a *Time–Life* book called *Mystic Places* where the entry read:

> The Swiss mathematician Leonhard Euler rejected the idea of multiple planets within, replacing them with a single Sun—which he thought provided warmth and light to an advanced inner-earth civilization.

This sounds like the English version of what Dr. Gordeev had happened upon. Unfortunately it provided no further clue as to its source for this information. In an e-mail dated 18 Feb 1998, Dr. Gordeev reminded me:

> *Opera Omnia* has a lot of [Euler's] letters, but not all of them. **Let me humbly remind you that many of Euler's letters are still in Petersburg**, **Russia**, **where he spent his most fruitful years**.

Dr. Gordeev told me that if I could find credible references to Leonard Euler's ideas and writings then he would have no problem getting access to them, even to those letters which are still in Russia. Another possible

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approach to the Euler Hollow Earth problem may be to try to gain some insight into his extraordinary thinking processes to see if perhaps he might have entertained such an idea.

Gravity is the most important part of the entire Hollow Planet discussion. Euler had a great deal to say about gravity and we will be examining Euler's thoughts on gravity in the next chapter.

His most popular book is *Letters to a German Princess*. Since this was produced in the latter years of his life, Dr. Gordeev and I looked through it to see if there was something relevant. I managed to obtain a copy of it under the name *Letters of Euler on Natural Philosophy* (1835). It is a voluminous work which covers a vast number of subjects. It becomes apparent that Euler, like Newton and Halley, was also a religious man. His writings cover almost every topic imaginable, from gravity to language; from life after death to morality, the nature of evil, etc.

There were no overt references to the Hollow Earth. There were references to a hole through the Earth. But this is in the context of discussions about the effects of gravity, and it was used in a hypothetical context only.

Incidentally, it is in this very book that Euler first propounded "Set theory." The Venn diagrams I studied in my high school mathematics classes originated from this very book. Dr. Gordeev told me that in his lectures he still refers to them as "Eulerian circles." One must not forget that mathematics and logic are closely bound. Euler applied logic, and mathematical processes to everything he could think of. He has been criticized for doing this.

Since Euler, like Halley, believed in God, and the creation, they had no doubt of the wonders which God could perform if he wished it so. In Letter LXXXIX he writes:

> What a prodigy, to behold a plant, a tree, spring from a small grain cast into the Earth, by the help of the nutritious juices with which the soil supplies it! **The productions found in the bowels of the Earth are no less wonderful: Every part of nature is capable of exhausting our utmost powers of research**, **without permitting us to penetrate all the wonders of its construction**.[13]

One can't help but smile at some of Euler's logic—if only because it is still relevant:

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> After having reflected in this manner [upon the wonders of nature], it will be difficult for you to believe that there should have been men who maintained, that the universe was the effect of mere chance, without any design. But there always have been, and there still are, persons of this description. . .[14]

Clearly humanity throughout the ages does not change much! When dealing with Euler, it seems to me that he used his logical ability to prove to himself that God existed. He did not use Biblical scriptures to determine his views of science. With him things worked differently:

> . . . and it is absurd to employ, as some persons do, passages of the Holy Scriptures to prove that the Earth is at rest, and the Sun in motion."[15]

Euler clearly believes that the universe and the Earth are part of a great design, and he would not be surprised at finding great things in its bowels. He is definitely open minded to such possibilities.

Some of the texts quoted earlier stated that Euler believed people lived inside the Hollow Earth—just as Halley did. This is something of a problem when dealing with classic Newtonian gravity. This is because when Newtonian gravity is applied in its standard form to the inside of a hollow sphere then we find that the gravity everywhere on the inside is zero. There are undeniable mathematical proofs showing this. Neither Halley, nor Euler were ignorant of Newtonian gravity. Dr. Gordeev pointed to these words of Euler:

> . . . it is clear that a body at the very center [of the Earth] must entirely lose its gravity, as it could no longer move in any direction whatever.[16]

Time and CNN conducted an Internet poll in 1998 which showed that 80% of those polled believed that intelligent life existed in the universe. This subject has been debated for centuries. The great Dutch scientist, Christiaan Huygens, to whom we owe the wave theory of light, was among the early scientists who believed that life existed in the universe. I discovered that Euler believed that people lived on other planets. I came across several references to this in his own words. When referring to relative motion he wrote:

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> . . . as it is very probable the inhabitants of other planets likewise form their judgment of rest from the same situation relatively to their respective planet.[17]

In the days before Euler became completely blind he always assembled his family and studied the Bible daily. It was one of his favorite pursuits. Yet, it did not affect his logical skills negatively. He continued to think very clearly and logically, and if anything, he seemed to be more open-minded as a result of it. He was convinced that the wonders of the universe were the result of planning and therefore, virtually anything was possible.

We will also be examining a possible link between mythology and ancient texts which suggest the existence of a subterranean world inside our own. According to David Brewster, Euler was highly knowledgeable in fields outside of mathematics:

> Euler's knowledge was not limited to mathematics and the physical sciences. He had carefully studied anatomy, chymistry (sic), and botany. He was also **deeply versed in ancient literature**. **He could repeat the *Æneid* from the beginning to the end**, **and he could even tell the first and last lines in every page of the edition which he used**. **In one of his works there is a learned memoir on a question of mechanics**, **of which**, **as he himself informs us**, **a verse of the *Æneid* gave him the first idea**.[18]

Brewster does however reproach Euler:

> In many of his physical memoirs, Euler has been justly reproached for having applied the calculus **to the most unfounded physical hypotheses**, or to metaphysical principles which had not been sufficiently examined; and **on this account several of his memoirs have no value whatever**. . .[19]

Brewster refers to Euler's writings on Naval Architecture, Gunnery and Windmills as "being among those which are liable to this criticism". The wording "unfounded physical hypotheses" does make one wonder if perhaps Euler did write about a Hollow Earth during one of his more fantastic writing sprees. Brewster regards these writings as having no value whatever, and that might account for them not being brought to the attention of scientists and

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being regarded as rubbish. They might be lying somewhere, un-indexed and not referenced. Perhaps Euler was merely speculating upon these things at the time, rather than suggesting valid scientific theories? Remember he also wrote about ethics, the human soul, God, etc.

Did Euler ever really think that the Earth might be hollow? That was something which Prof. Gordeev, Dr. Gohnert and I discussed a number of times. In spite of our searches none of us could find Euler's original writings on the matter—if they exist at all. Having established that Euler was definitely a broad thinker and very open-minded, perhaps one could try to reason as a mathematician might? Euler knew of Newtonian gravity and supported it. Could there be any logical reason for thinking that a planet might be hollow?

The only possibility which comes to mind is that a spinning sphere might become hollow naturally. This was originally suggested to me by John Flora, who joined my Internet list. His argument is as follows: Scientists believe stars and planets formed from huge clouds of dust in space. Gravity caused them to condense. Then they started spinning and eventually became spheres. John points out that if this is the case then, like an ice skater, these stars and planets would have spun ever faster as they contracted. This would be dictated by the law of conservation of angular momentum. However, the solar system tells a different story. It is not the smallest planets which spin the fastest, but the largest ones. The Earth rotates in 24 hours, and many of the planets smaller than it rotate even slower. Jupiter, the largest planet, which has a diameter more than ten times that of the Earth spins about its axis in a mere 10 hours. This is not what one would expect from condensed, solid planets. John pointed out that this is also true for the different types of stars. The larger stars spin faster than the smaller ones.

He believes that it can be shown mathematically that a high rate of rotation would cause a spherical body to expand until it reaches a point of maximum inertial stability. In an e-mail dated 15 February 1998, he explained in part:

> As I said earlier, **the maximum moment of inertia for a rotating sphere to spin stably is that of a hollow sphere**, and that moment of inertia, is 2/3 x Mass X (Radius squared); On the other hand, the force of gravity is written mathematically as G x Mass / (Radius squared), where G is 2/3 x 10^{25} (in SI system). . .

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John goes on to suggest that the similarity between the force of gravity and the maximum moment of inertia for a rotating sphere is no accident. He suggested that the planets and stars be regarded as “tornadoes in space.” He explained:

> This smaller size—slower rotation, bigger size—faster rotation relationship of planets and stars rotations is exactly what you would think if the planets and stars were created hollow however! Because, according to spherical shell dynamic theory, the planets and stars were created out of convection currents between warm and cool regions of space, swirling the particles into whirling, twirling tornadoes of particles. **In the zero-gravity of space these tornadoes took on the shape of spheres with open poles**, **and the faster they were rotating**, **the larger they became!**”

John’s logic also suggests that Hollow Planets must have Polar Holes of some kind. He pointed out that there was a point at which centrifugal force and gravitation balance. Gravity, (as we shall see later), is zero, at the center of the Earth (or any hollow sphere). All mathematical exercises show that if one could suspend an object at the center of the Earth, then it would be weightless. So when a forming planet rotates, the matter at its core will be flung away from the center. Gravity however, increases as one moves away from the center of a planet because there is more matter “below” it. So a point is reached whereupon gravity is stronger than the centrifugal force, and the expansion then stops. One thus ends up with a hollow spinning sphere.

I asked Prof. Gordeev whether John’s line of thinking had any validity. He replied by saying that this would indeed be true as long as the planetary body was homogenous. I asked him if someone had done a study of it. In an e-mail dated 16 Apr 1998, he replied as follows:

> I figured it out myself. Later I realized that things can get more complicated, but the basic idea remains sound under some assumptions. The argument is as follows. First take a non-spinning globe filled with a ‘homogeneous’ mixture. Suppose that the globe has some ‘initial crust’. Let us start spinning it. First of all, under the centrifugal force, ‘light’ elements will move away from the center, thus creating a new ‘heavy core’. (By the same token, in a spinning liquid with metal powder, one

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> gets a small metal ‘core’ in the center on the bottom.) Now those ‘light’ materials will move further until they reach ‘initial crust’; this will result in making the crust more and more ‘solid’ and the rest more ‘hollow’. As a whole, this will gradually provide us with the desired model ‘heavy core’—‘nothing’—‘solid crust’. I suspect that employing the gravity–as–pressure hypothesis one can arrive at the same model without the ‘initial crust’ assumption.

Dr. Gordeev’s reference to “gravity–as–a–pressure” is interesting. As we will learn, Euler’s scientific writings definitely show that he thought gravity was created by an external pressure. This may add to the possibility that he thought the Earth was hollow.

I mentioned earlier that Lee Krystek thought that Euler’s Hollow Earth model had Polar Holes in it. Could these result from natural rotation? I thought they might, but Prof. Gordeev disagreed. I then asked Prof. Gordeev why scientists weren’t currently arriving at the same conclusion as he postulated above. His answer:

> Well, current theories don’t differ much from my conclusion (above), except that they put a semi-liquid ‘emulsion’ instead of ‘nothing’. It is understandable because in order to keep that hollow model stable you need some interaction between the ‘core’ and ‘crust’ (whether attraction or repulsion). On the other hand, that alleged semi-liquid material creates other troubles (which our scientists prefer to ignore).

So what Prof. Gordeev concluded, after our theoretical exercise, was that conceptually, scientists had arrived at the same model, except that they filled it with a semi-solid material. He also suggested that if gravity were a pressure then there would be a greater possibility that planets were hollow.

It seems to me as if the rotation idea could be the solution to the whole problem. It does result in a model which is strangely similar to that which it is claimed Euler had proposed: heavy core (inner Sun?) inside a single gigantic hollow shell, as opposed to Halley’s multiple concentric spheres. So there does seem to be some sound logic behind it. Although Dr. Gordeev ruled out Polar Holes, I would like to remind the reader that Newton had predicted that a spinning planet would be flattened at the poles. You will remember that Halley had suggested that a luminous atmosphere was

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escaping out of his Hollow Earth because the polar crust was thinner. Now if we are dealing with a flattened hollow sphere would that not imply the thinnest crust would indeed be in the polar regions? Even if the spinning itself does not form a small hole, one might still be faced with the possibility of the crust collapsing either through earthquakes, or perhaps through earthquakes triggered by comet and asteroid strikes. So there may be some logic yet to the idea of Polar Holes.

I have not been able to trace the thinking which caused people to adopt the Polar Hole idea. Marshall Gardner was an American, who seriously proposed the idea again in 1913. He wasn't a scientist. Instead he seemed to be something of an inventor, and perhaps even an engineer. He invented a number of sewing machines which were used to assemble corsets. He later became the owner of the Gardner Sewing Machine Co. He became quite wealthy. He lived in Aurora, Illinois, and was a well-respected member of the community. At the age of 59 he used his savings to publish his book. It was first printed in 1913, and revised and printed again in 1920. It was titled: *A Journey to the Earth's Interior, or, Have the Poles Really Been Discovered?* Nevertheless, like me, he was something of a hard-headed person, and he proposed that the Earth was hollow. His rationale for the existence of a Polar Hole was that magnetism was pouring out over the rim of a hole.

Unfortunately, he does not enlighten us as to the source of his ideas or the preceding history on the matter. Kafton–Minkel believes that Gardner revived Euler's central Sun. Kafton–Minkel writes:

> Gardner, like most of the Hollow Earth proponents. . . abandoned the unwieldy idea of concentric spheres, but he also resurrected an idea just as awkward, but far more useful—Leonhard Euler's central Sun.

Incidentally, it is Gardner's central Sun which is also 600 mi in diameter. I must of course disagree with Kafton–Minkel's description of the idea as unwieldy. As we have seen, there is a very logical explanation for the idea of a central "core".[20]

Since Halley's time various writers had tended to adopt the single shell idea with a molten core/Sun in the center and two Polar Holes. There were modifications of course, like Reed, another American who also proposed the idea in 1908. Reed suggested that enormous volcanoes lit up the inner Earth with a dim red glow, and he tried to prove that dust in the arctic originated

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from these volcanoes.

I would be most interested to see the results of a computer simulation of a rotating sphere to see what transpires. The most reliable reference I could find to Euler's Hollow Earth ideas comes from a 1952 book called *Lands Beyond*. It examined, in a cold scientific fashion, the many ideas of strange lands. It documents the legendary southern continent which was unreachable because of the equatorial torrid zone. It deals with Atlantis, El Dorado, etc and dispenses with them all in a scientific fashion. It does the same with all Hollow Earth ideas. Hence it cannot be said that the authors were trying to promote the idea on a false basis for they were actually against it. With regard to Euler and the Hollow Earth theory it states:

> Sir John Leslie, Dr. Edmund Halley (of the comet) and the German mathematician Leonhard Euler, three contemporaries who worked on many of the same problems, **all speculated about the possibility of the Earth being a hollow sphere**. And if the Earth was hollow, **there might be a separate fiery core or miniature Sun in the center of the hollow ball**. Leslie supposed two such bodies which he named Pluto and Proserpina. **Leonard Euler was satisfied with just one**, while Dr. Edmund Halley proposed something more complicated by far.[21]

According to the above, and going by my own research, it seems as if Euler's thoughts may indeed have been speculative. Halley presented his ideas openly to science, but Euler might not have been as public about his views. If he ever did write about this then it might be in letters which were considered "rubbish" and which were never published as a normal part of his scientific work.

Halley's concentric spheres idea has always attracted a wide audience—perhaps because of the very bizarre nature of his speculations. There can be absolutely no doubt that his idea existed. Halley was convinced that the Earth's magnetism was caused by these spheres which fitted inside each other. When Euler wrote about the Earth's magnetism he mentioned Halley—but he never once mentioned Halley's concentric spheres theory. Could it be that when Halley's concentric spheres idea was rejected by most scientists, that he then formulated something simpler and more acceptable to science? Could it be that Euler, likewise had to separate his speculations from "acceptable science?"

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One of the rationales presented earlier this century for the Earth being hollow is that there is a warm climate inside, fuelled by heat from an inner Sun. This warm air then escapes through Polar Holes and causes the arctic to be warmer than it would otherwise be. This might of course be a recent development, because I have not come across any mention that Halley or Euler believed or suggested such things. Euler definitely did not believe the poles were warmer than they should be. He wrote:

> . . . for it is well known, that the nearer we approach these two points, [the poles,] the colder and more rugged the face of nature becomes, to such a degree that the regions adjacent to the poles are absolutely uninhabitable, from the excessive cold which prevails there during the winter.[22]

We will be meeting up with Leonhard Euler again when we discuss the mysteries of gravity.

SIR JOHN LESLIE (1766–1832)

Sir John Leslie was a Scottish physicist and mathematician who also proposed that the Earth might be hollow. Thomas Hay, eighth earl of Kinnoull was the chancellor of the university of St. Andrews. He saw promise in young Leslie and offered to pay for his theological studies. But Leslie soon found that he preferred science to theology. Upon the death of his sponsor he gave up his intention of entering the church. He spent some time in America, and later travelled extensively through Europe at every opportunity.

His first physical paper was *Observations on Electrical theories*. He is best remembered for his studies of heat. He invented several instruments for use in the sciences of heat and meteorology, among them the differential thermometer.

His researches led to a paper in 1804, *Experimental Inquiry into the Nature and Properties of Heat*, is regarded as one of his more important contributions to science. Some of his discoveries were later disproved, but at the time they represented a substantial advance over the theories of the time. His work resulted in the Royal Society of London awarding him the Rumford medal in 1805. Prof. Playfair exchanged the chair of mathematics at Edinburgh for that of natural philosophy in 1805. Leslie was then elected to

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Playfair's vacant chair.

In 1809 Leslie published his *Elements of Geometry, Geometrical Analysis and Plane Trigonometry*. It was noted for its freshness and originality of thought and at times departed from traditional methods. It attracted considerable attention and was translated into French and German. By 1820 it was in its 4th edition. Among his other mathematical papers were: *Geometry of Curve Lines*; *Descriptive Geometry and the Theory of Solids* and a treatise on the *Philosophy of Arithmetic*.

Much of Leslie's work was related to meteorology. He conducted many experiments and also wrote many articles and papers. Among them: *The Attempts to Discover a Northwest passage*. In 1815 he also began work on a series of contributions to the *Encyclopedia Britannica*. In 1819 Leslie was elected to the chair of natural philosophy at Edinburgh.

It is said that like many original thinkers Leslie lacked the power of lucid exposition. His last important work was contained in the Encyclopedia Britannica and was titled, *Discourse on the progress of Mathematical and Physical Science during the 18th Century*. He was knighted early in 1832 on the recommendation of Lord Brougham and died later that same year. It seems as if Leslie was something of an original thinker in much of what he did. At times he was at variance with science. For example he suggested that cold, like heat, had an objective existence. He clung to this idea tenaciously.

I could not find any reference to Leslie's thoughts in the *Dictionary of National Biography*. According to Kafton–Minkel, Leslie proposed that the Earth was hollow some time after Leonhard Euler did. Unfortunately he doesn't supply us with more accurate information than this and I have not managed to find much myself. Exactly what it was that caused him to think along these lines I do not know. It is interesting that pure mathematics and geometry were among his fields of interest, as was meteorology. Could the rotation of the Earth also have affected his thinking?

Leslie also took Edmund Halley's suggestions further regarding an Inner Sun. Halley had suggested that there might be "peculiar Luminaries" inside the Earth. Leslie seemed to base his thoughts on the discovery of binary stars by Sir William Herschel and suggested that there might be dual molten cores inside the Hollow Earth, which would serve as its "Sun." He even named his two "little suns": Pluto and Proserpina![23]

I can only speculate as to why Leslie made the suggestions he did. Possibly the idea of a dense molten core serving as an "inner Sun" might

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show that he had considered the effects of rotation. But why two inner suns? Could it be that he also drew on Halley's thoughts that there were four magnetic poles? Could Leslie's idea be a type of Halley/Euler hybrid? Or did he feel that two orbiting inner suns might be a more stable?

No one has written more accurate science fiction than Jules Verne. But how many people realize that Jules Verne's great classic: *Journey to the Center of the Earth* is based on the Hollow Earth theory? Verne normally stated whose theories he was following. With regard to *Journey to the Center of the Earth* he hinted that it was based on "the ideas of an Englishman." In it Verne wrote:

> Gazing around, I began to think of the theory of the English captain, who compared the Earth to a vast hollow sphere in the interior of which the air is retained in a luminous state by means of atmospheric pressure, while two stars, Pluto and Proserpine, circled in mysterious orbits. After all, suppose the old fellow was right!

It seems as if there is reason enough to believe that Sir John Leslie entertained some strange ideas about the Earth. Could it be that science fiction may yet again become science reality? Kafton–Minkel comments upon the short life of the Hollow Earth idea among scientists:

> The publication, and rejection, of Leslie's and Euler's theories marked the last gasp of the Hollow Earth idea among orthodox scientists, but the idea itself was just beginning to blossom.[25]

Kafton–Minkel is not quite correct, the idea of Hollow Planets and moons continues to be raised.

RUSSIAN SCIENTISTS

The idea of Hollow Planets seems to have found a home for itself among Russian scientists more than anybody else. In this century Russians have twice suggested that planetary bodies might be hollow. The first was the suggestion that one of the moons of Mars was hollow. The second was when two senior scientists from the Soviet Academy of Sciences, as it was then known, suggested that our Moon was hollow. Could any of this thinking be related to Euler's thoughts on the matter? From what I could see it does not

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seem so. The most serious recent suggestion was that the Moon might be hollow. In the mid-1970s Vasin and Shcherbakov from the Soviet Academy of Sciences suggested that the Moon was a huge alien spaceship!

One may wonder how two senior scientists can come up with such a preposterous theory. The problem has to do with the origin of the Moon. No one really knows how the Moon came into being. If the Moon and Earth formed together in orbit why are the surface materials of these two worlds so dissimilar? There are also some rocks found on the Moon which might be older than the Earth. Perhaps the Moon came from elsewhere? Perhaps even from outside our solar system. Many scientists have suggested that. But here Newtonian gravity becomes the problem. According to all calculations and models produced by scientists, the chances of a successful capture of the Moon by the Earth as a mere random event is one in billions. The chance of you winning first prize in a million dollar lottery ten times in a row is probably greater than the chance that the Earth captured the Moon by accident.

How could the Earth have captured the Moon against such odds? That is why these two Russian scientists suggested that the Moon was steered into orbit by intelligent beings—who perhaps, are no longer around. Or perhaps they still live there inside the Moon? Why a hollow Moon then? Apollo 12 placed the first seismometer on an alien world. NASA did not expect many Moon quakes. They expected the Moon to be seismically dead. To ensure some kind of seismic results they deliberately caused part of a rocket to crash into the Moon. When they did this, the results astounded all the theoreticians. The Moon's behavior was quite unexpected. It "rang like a bell" for almost an hour. Scientists were quite stunned at the time. Quotes from the scientists of the time are quite interesting. *Science News*, in its 1970 Yearbook stated that:

> The theorists were caught unprepared, which, as often happens, resulted in even more hypotheses than would have developed from data that supported someone's favorite theory.

It goes on to suggest, but only for a second, that maybe the Moon is hollow:

> . . . the first day or two after the event, many researchers were reluctant even to try to devise a lunar model that would fit the strange

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> phenomenon. Some such models would have made for a rather bizarre Moon, 'Such as a hollow titanium ball,' said Captain Scherer, 'Which is highly unlikely'.[26]

If American scientists were staring at data which initially suggested to them that the Moon was hollow then it is not surprising that some scientists in the Soviet Academy of sciences were doing the same thing. The Russians virtually took Sherer's words out of his mouth. They indeed suggested that the Moon was a hollow titanium-type ball, manufactured artificially of course. Captain Scherer's comment that it is "highly unlikely" is interesting. How easy it is to dismiss data when it doesn't match your favorite theory. Do other scientists do the same thing?

The Russians, Vasin and Shcherbakov then wrote a paper entitled "Is The Moon The Creation Of Intelligence?" It was published in the Russian journal, Sputnik. They proposed reasons for supposing that perhaps the Moon was hollow. Scientists are quite convinced that planets can't be hollow—especially not naturally. So it was quite convenient for the Russians to lump two ideas together which could be solved by suggesting the presence of an extraterrestrial intelligence. They suggested that some advanced race, once upon a time hollowed out a small planet (presumably making it larger), and then somehow steered it into orbit around the Earth. This would account for the anomalous seismic results, and it would also explain how the Moon managed to enter Earth's orbit against odds of billions to one.

As with God, one could invoke extraterrestrial intelligence to explain all manner of things. We could, if we wished, suppose that the Earth was hollowed out by an advanced civilization too. But that is not the purpose. We will confine ourselves to musings regarding the possibility that planets might be hollow naturally. Whether someone or something lives inside these bodies is a secondary concern. The primary concern is whether these bodies are all hollow, not just the Moon or the Earth, but all the bodies in this solar system.

The Russians did however make this point:

> And all the arguments about the possibilities of intelligent life existing on other celestial bodies have been confined to the idea that other civilizations must necessarily live on the surface of a planet, **and that the interior as a habitat is out of the question**.

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> **Abandoning the traditional paths of 'common sense,' we have plunged into what may at first sight seem to be unbridled and irresponsible fantasy. But the more minutely we go into all the information gathered by man about the Moon, the more we are convinced that there is not a single fact to rule out our supposition. Not only that, but many things so far considered to be lunar enigmas are explainable in the light of this new hypothesis.**

The Russians pointed out that the Moon's density was only 3.33 gr/cm^2 as opposed to the Earth's 5.5 gr/cm^3. And that lunar rock is not of the same composition as that of the Earth. The "titanium shell" idea mentioned by Scherer received further support from the Russians because the lunar craters are very shallow in spite of the tremendous energy with which the Moon was struck by meteors.[27]

Since the Hollow Moon is not the subject of this book I only wish to use the above text to illustrate one modern example of how some scientists recently proposed that a planet, in this case the Moon, is hollow. The Moon's density is indeed very low. It is similar to that of aluminum, which is of course exceptionally light. The Russians were basically saying that the Moon is hollow but the Earth is not. This is the point at which I differ with them, and you will see why as we progress through the subject.

These two scientists never produced a model of the hollow Moon. They never stated how thick they thought the crust might be or what may lie inside. Don Wilson, the American picked up on their idea and tried to show that someone is living inside the Moon right now.

The Moon has long been thought of as a dead world. However, some strange things have been seen on its surface. Some astronomers thought they saw volcanoes on the surface of this supposedly dead world. Others have seen strange clouds of gas and even water vapor emanate from various craters. Inexplicable lights have been seen on and around the Moon. Astronomers have coined the phrase "Transient Lunar Phenomenon" (TLP) to describe these strange sightings which have been going on for hundreds of years. Don Wilson painted the picture that there is a subterranean civilization living inside the Moon to this day.

It may interest the Reader to know that in 1959, a prominent Russian astronomer produced spectrographs showing what he believed was a volcanic eruption which he detected on the Moon. There is indeed more activity on the

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Moon than we used to think. The Moon is definitely not as geologically dead as one may think. We now know that Moon quakes occur with clock-work regularity.

This idea of the Moon being a spaceship is only valid of course if planets are naturally solid. But what if planets are naturally hollow? That is the idea which I set out to explore. Does Newtonian gravity really work the way we expect it to? One does not need extraterrestrial intelligence to account for the Moon being here, or the Moon being hollow. Could all other worlds be hollow? It would be most unlikely that only one hollow world formed naturally. Is it possible for hollow worlds to be the rule rather than the exception? That is what we are going to explore in this book.

HOLLOW MARTIAN MOONS

Vasin and Shcherbakov also reminded us that in 1959 Prof. Iosif Shklovsky, another eminent Russian scientist proposed that both moons of Mars (Phobos and Deimos) were hollow. The Martian moons are extremely small, and are little more than pieces of rock—in all probability captured asteroids. So they do not really fall within our definition of Hollow Planets. Shklovsky is not the only scientist who has wondered if the Martian moons are hollow. The reason the occasional scientist has suggested that one or both of them are hollow is because of their strange orbits.

HOLLOW JUPITER?

In my reading and investigation of this subject I have been suitably impressed by the open-minded ideas which seem to originate from Russian scientists. They seem to be more open to new and original ideas than any other scientists. I applaud their creativity. A magnificent example of scientific creativity from Russia relates to Dr. S. K. Vsekhsvyatskiy. Scientific literature accords the discovery of Jupiter’s Ring to the NASA Voyager flights to that planet. Prior to Voyager no one believed that Jupiter might have a ring around it like Saturn has. It is thus confidently stated that Voyager discovered the Jovian ring.

In articles published in *Science News Letter* in 1961, and another in *New Scientist* in 1964, Dr. S. K. Vsekhsvyatskiy of the Kiev State University presented astronomical evidence for his belief that Jupiter was circled by a ring of comets and meteors. Vsekhsvyatskiy also made detailed studies of

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short-period comets and concluded that they originated from Jupiter itself. He developed the theory that comets actually spewed forth out of Jupiter!

The credit for the discovery of the Jovian ring should really be given to Vsekhsvyatskiy in my opinion. It goes to show that perhaps technology is not everything—that creative thinking and reasoning can still be a sharper tool. After all, Vsekhsvyatskiy presented the scientific evidence for the Jovian ring twenty years before Voyager photographed it.

I don't know how he thought these comets were created or how Jupiter managed to "spit" them out. It would however, require a considerable amount of energy since the Jovian gravitational field is very strong.

In 1949, another Russian (in this case a psychologist) by the name of Velikovsky wrote a book, *Worlds in Collision* in which he proposed that the Earth had collided with other planets. Among his proposals was one that Venus was itself the product of Jupiter. He proposed that perhaps Venus had been launched out of Jupiter—perhaps from the Great Red Spot!

Vsekhsvyatskiy's thoughts have a certain similarity to those of Velikovsky. Vsekhsvyatskiy however was an astronomer who specialized in studying comets. He accumulated considerable scientific evidence to support his view. I have wondered if Velikovsky got his inspiration from Vsekhsvyatskiy's writings?

If I ever get around to writing a second book on the subject I most definitely want to raise issues relating to Jupiter, Saturn and Uranus. I think quite a strong case can be presented for a hollow Jupiter. Could it be that the gaseous giant is perhaps not so gaseous after all? Could it be that some kind of powerful nuclear furnace burning at the center of that planet can produce violent eruptions which perhaps spews out comets?

On the basis of some fascinating scientific discoveries relating to the Great Red spot on Jupiter I think quite a strong case can be made for the theory that the Great Red spot might be caused by a gigantic hole in the side of a hollow Jupiter. The evidence for such thoughts are highly supportive of Vsekhsvyatskiy's work.

In the 1960s, Raymond Hide from the Massachusetts Institute of Technology advanced a theory that the Great Red spot was caused by a "physical feature." He suggested that this "feature" might be a "depression." Hide's theory of the Great Red spot made a lot of sense and was popular among many scientists including Dr. Carl Sagan for a number of years. It is only recently that Hide's theory has been replaced by the "stable storm"

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theory. Hide's theory states that the Great Red spot operates like smoke from a chimney. Imagine how the smoke drifts in different directions depending on how the wind blows. The Great Red Spot might represent the "smoke" from this chimney. It then drifts around, but never too far from the chimney which causes it in the first place.

Hide's theory is very workable if we consider that Jupiter might have a hole in its crust and this "smoke" is pouring out from it. The Great Red Spot also disappears. Hide accounted for this by saying that the "smoke" was always there but, it just happens to change color.

The possibility exists therefore that the work of Hide in the USA and Vsekhsvyatskiy in Russia might actually dove-tail into the same thing. The final result might be that the largest planet in the solar system is hollow. There are some other fascinating mysteries regarding Jupiter and Saturn, but I will keep them to myself for now!

BLACK HOLES IN THE EARTH

This book is, in some respects, a "theory of everything" since it encompasses a whole new line of thinking based on an old idea. I'll be the first to admit that original thought can produce some strange results. In this decade another Russian scientist has dared to challenge the current model of the Earth with its iron core. He is A. P. Trofimenko and he first proposed his idea in the well-respected journal, *Astrophysics and Space Science* (168:277).

Trofimenko suggested that the Earth and other astronomical bodies might be riddled with miniature Black Holes. These miniature Black Holes might provide an explanation for gravity anomalies, volcanic hot spots and many other things. Trofimenko suggested the existence of 126 miniature Black Holes inside the Earth. In spite of their small size, they would have a tremendous mass and he uses this to explain the very high density of the Earth![28]

I don't agree with Trofimenko, but it does illustrate that to some scientists, even now, there are many unexplained things about the Earth. It demonstrates that some scientists are not satisfied with some of the current explanations we have and that perhaps there is still more room for speculation than many think. In Trofimenko's model he does away with the extremely dense iron core in the Earth. This is a very radical departure from current thinking. Many people will be excused for thinking that things such

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as an iron core are indisputable facts.

HOLLOW PLANET THEORY

The speculations started by Halley have spawned much thinking over the centuries. Ever since Cavendish "weighed" the Earth in his famous experiment, our scientists have been convinced that it is solid.

Today everybody regards this as an incontrovertible fact. But is it really so? It is amazing how "facts" can be consigned to the rubbish heap of science. The most solid looking theories have fallen foul of new discoveries and new thinking. What makes you think that things will be any different in our generation?

This creepy idea has fascinated me a great deal, and I have begun wondering if there is perhaps more to this than meets the eye. Everyone is so exceptionally quick to dismiss it without a moment's thought. And yet, that is exactly what we should be striving for—more thought and more analysis.

Let me lay some "ground rules" for this little feasibility study of mine. We know that Cavendish determined that the density of the Earth is extremely high. Incidentally, the Earth is the most dense planet in the solar system. There are scientists who wondered if the planets in the solar system are hollow. In the 1960s, the English astronomer, Patrick Moore, wrote a small book to refute the idea that Venus might be hollow. I think it went by the title of: *Can You Speak Venusian?* I tried unsuccessfully to obtain a second hand copy of it so I can't comment upon it.

The Russians who thought that the Moon was hollow did so on the basis that the Moon was very much lighter than the Earth. The same is true for the scientific suggestions that the mini-moons of Mars were hollow. Apart from these speculations however, other astronomers have stated that no, none of the planets can be hollow—DEFINITELY NOT!

Now on what basis did they make that statement? I can tell you. The answer lies in Newtonian gravity. Newtonian gravity predicts the motion of various planetary bodies. Newtonian gravity enables us to "weigh" every object in the universe. We can determine the mass of Venus, of Mars, the Moon and Jupiter by this one formula alone.

So, apart from the Moon, we find that the other planets are quite as solid as the Earth. If Venus were hollow for example then it would not have a density similar to that of the Earth. But Venus has a density similar to the

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Earth's. So astronomers are very confident that no planet in this solar system is hollow. Of course, the "gaseous giants" like Jupiter and Saturn, do indeed have very low densities. Saturn is so light that if one could find an ocean large enough then it would be able to float on it. Is that because it is hollow? No, of course not, because it is a different class of planet altogether to the "terrestrial" planets like Earth. So again, the answer is an emphatic NO!

There is no way of determining the absolute mass of a planet except in the way Cavendish did it. All one can do is to determine the mass of all planets with respect to that of the Earth. Herein lies the key logical argument, and the issue which I wish to raise.

No one disputes Cavendish's experiment or the logic upon which it is based. No one disputes the seismology which has evolved on exactly that same basis. Yes, I am questioning the very roots of these sciences.

These scientists are quite right that if the Earth is solid then indeed all the other planets are also solid. But, the reverse is exactly true as well. If the Earth is hollow, then all the other planets of the solar system must be hollow too. The Earth is the densest planet in the solar system, therefore if it is hollow then so are all the others. This has to be the case or else astronomers would have noticed orbital discrepancies. For example, suppose Earth was hollow but none of the other planets were, then we would immediately have discovered it. This simple argument has been obvious to me from the beginning and I have never come across anyone who has addressed it.

The so-called, "gaseous outer planets" seem to be composed only of gases and ice and have virtually no surface. But some of their behavior is very strange indeed. In this book we will be examining the densest planets in the solar system, Mercury, Venus and Earth. The only reason I started with these planets is because I had decided to take each planet, one by one, and to scrutinize it closely, so I started with the planets closest to the Sun. But let me point out to you at the outset that this idea which I am proposing is by no means limited to Mercury, Venus and Earth. It applies to every object in this solar system, and I believe quite a good case can be made that some of the planets in the outer solar system are hollow.

You can take it, that if the three Inner planets are hollow then it means they all are. Unlike those Russians, I am not proposing that anyone hollowed these planets out. No, I am pursuing the angle that planets might be naturally hollow and that somehow this has escaped the attention of scientists for the simple reason that they are dealing with the relative masses of the bodies in

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the solar system while erroneously imagining that we really know the mass of the Earth.

I have become very curious about this one idea which everyone mocks. Many very strange things begin to make sense when one looks at the solar system on this basis. Many things which previously had scientists puzzled, suddenly don't seem so puzzling any more.

How do planets become hollow? I don't know. But two ideas seem to have possibilities. The original theories seem to have been derived from the mystery of geomagnetism, but there seems to be a strong mathematical case for hollowness to be the result of rotation. Current theories hold that indeed the planets accreted from rotating dust clouds, and that each planet began rotating as it condensed. Hence the scene is set for the effects of rotation. Do different rates of rotation produce different effects?

Prof. Gordeev suggested that a spinning globe would only become hollow if it were homogenous. But does it not follow that an accreting dust cloud probably is homogenous? Would that not imply that planets must be hollow by default?

When I first mused over this idea, I did a bit of reading just to quickly test the idea. It consisted of a bit of reading and a bit of thinking to see if this idea had any merits. That exercise led me to four simple conclusions:

1. Geomagnetism is not fully explained and has many problems. Could this be because the solid Earth is a bad fit? No one knows for example how the geodynamo got started in the beginning.
2. There is a strong relationship between geomagnetism, the aurora and the events which take place in a nuclear reaction.
3. All planetary masses are relative, and while it is valid to say that all planets are solid on this basis, it is equally valid to state that they might all be hollow on the same basis. The key is in determining the Earth's mass.
4. Is there anything in seismology which could be a misinterpretation of a hollow cavity? The answer is Yes, the Earth's "Outer Core" could easily be a cavity. The only negative is how did scientists determine the existence of a solid Inner core? This is theoretically impossible if the planet is hollow. Nevertheless, I was quite satisfied that the "Outer Core" seemed to have the characteristics of a hollow cavity. I hoped to

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later discover perhaps what error had caused scientists to think there might be an Inner Core. I now believe I can suggest an answer.

Of the above, (3) and (4) were the most important. Once I was happy with the finer detail of these points I resolved to attempt to do a study as best I could, with my limited knowledge.

At that point, I wondered what could make a planet hollow. The rotation idea was not mine, and was only suggested to me by others later and Dr. Gordeev confirmed that it seemed to have a sound basis. It seems to me to be an idea with some strong possibilities.

When I read these old ideas about “suns” inside the Earth I began to wonder if there was any scientific evidence which would enable one to test this idea. In those days, people did not know how nuclear reactions work. We still don’t know completely, but we have made considerable advances. The simple fact that nuclear explosions and reactions create strong magnetic fields made me wonder if indeed a small “Sun” might reside at the Earth’s core?

The Earth’s geomagnetic field has a number of similarities to that of the Sun. Stars have nuclear reactions going on inside them, but what if planets have a similar process? Not nuclear fusion of course like a star, but nuclear fission which is based upon heavy materials. Could it be possible that there is a nuclear reaction going on inside the Earth at this very moment? How would we know?

That led to the next thought: Could the initial ignition of a central Sun have hollowed out a planet? We know that nuclear explosions can turn desert sand into glass. We know of the unbelievable heat and force which can be generated by such things. A simple underground nuclear test can send seismic shock waves around the world which seismologists are practised at analyzing. Could a naturally occurring nuclear reaction hollow out a planet?

What of the asteroids which lie between Mars and Jupiter? For centuries scientists have speculated as to whether this is a disintegrated planet or even an exploded planet. An exploding planet? How? Surely a large enough nuclear explosion could tear a planet apart? Why not?

Those initial thoughts began to convince me that here was an idea with some merit. Would planets be hollow by rotation? How would an Inner Sun form? Or could it be that the rotation causes all the heavy material to form into a solid core which then enriches itself and starts a nuclear reaction?

And what of Polar Holes? Do they form by rotation? Or do they form by

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explosion, since the crust in the polar regions would be thinner than elsewhere? Or, could it be that planets can be hollow and have no outward signs, no holes, which can give that away? Perhaps, they are hollowed out as enormous amounts of lava pour out through volcanoes. Entire sub-continents are the products of lava flows of the most enormous kind. Could this material actually come from inside a planet in the process of being hollowed out?

Could it be that the heavier material is actually thrown out on to the surface, while a planet is turned inside out, and the lighter material lies deep beneath the surface? Would this affect the Cavendish experiment? Or does gravity behave differently hundreds of mi beneath the planet's surface? All this would be at variance to current thinking.

It is important to understand that perhaps planets can be hollow and show no obvious signs outwardly. Perhaps the Moon is hollow but there's no gigantic hole to indicate such a fact. Perhaps the same is true of the Earth. Or could it be that tiny holes do indeed exist in the polar regions of some planets and that we just have not looked properly? The above, in a nutshell, represents the basic thinking which I wanted to test. So keep that in the back of your mind as you read this book. Remember, I really don't care which theory is correct, or which hybrid solution explains why planets are hollow. The only factor is whether planets are hollow. If it should turn out that they are, then I have no doubt that suitable theories will evolve to explain what exactly happened. These broad thoughts of mine were merely to test the logic to see if such a possibility could be within the realms of logic, science and mathematics. And yes, there seemed to be some reasonably sound logic upon which this idea could be kicked off.

CONCLUSION

Even now, a few scientists are still out there questioning the very roots of science, and we will meet some of them. As you can see, the idea of Hollow Planets has been broached time and again for centuries, right up to the present time. Every now and then someone revives this idea because he sees some merit in it. But very few have done a really deep analysis of it. I hope this book will rectify the situation. Let me present you with the strangest planetary theory seen in a very long time, and the results of my curious study. Even if I am wrong, I hope you find the ideas and logic refreshing and original, and filled to the brim with new possibilities. Science

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is really exciting, and I hope that you will delight at the amazing thoughts which have crossed the minds of many great people of the past. These people enriched our civilization and made it leap forward. Perhaps we can work together to see if we can solve the problem of whether planets are indeed hollow or not?

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Chapter 2: Newtonian Gravity Revisited

NEWTON'S LAW OF GRAVITY

Newton's Law of Gravity is one of the most useful mathematical formulae ever devised. This little formula has made space travel and the exploration of the Solar System possible. It made satellites possible. We owe a great debt to these two great Englishmen: Sir Isaac Newton and his sponsor, Sir Edmund Halley. Scientists use this little formula to gain an understanding of galaxies far away, and indeed the behavior of the universe as a whole.

It is now more than 300 years since Newton devised this little formula and we still do not know what causes gravity. Attempts to find "gravity waves" have been unsuccessful, and no one really knows what it is that causes objects to fall to the Earth.

The Reader might wish to challenge me on this point by stating that gravity is caused by matter attracting other matter. This however is as much as Newton knew, and as much as we still know. What we do not know is how or why matter should attract other matter. Many scientists have tried to answer this question unsuccessfully so far. Other scientists have tried to avoid the issue, in a most unscientific manner.

Carl Sagan, J. Leonard *et al.*, who authored *Planets* wrote this regarding Newton's Law of Gravity:

> **As to why Newton's law works**, **most scientists feel that this is a meaningless question**. It happens that the universe is so made that Newton's law provides an excellent summary of the observed motions. There may be no deeper truth to it than that.[1]

With all due respect to the late Sagan, Leonard *et al.* and the scientists whom they are referring to, but isn't that an outright rubbish answer? It is the task of science to find out why gravity works and I'm sure it will be done one day.

The whole debate about gravity, from the beginning, has rested on the mysterious manner in which gravity can operate without physical contact between two bodies. This solar system, which is billions of mi in diameter operates quite happily according to Newton's law. Scientists have measured

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the complex interactions of the planets, comets and asteroids as their gravitational fields interact with each other. Recently, we have been treated to the spectacular sight of Jupiter acting as a celestial vacuum cleaner and causing a comet to crash into it. Gravity is clearly at work in the solar system. NASA uses it as a type of sling-shot to accelerate
to incredible speeds. How can bodies, millions, tens of millions and billions of miles apart from each other affect one another? The planets are enormous by human standards, and they move at incredible speeds. The Earth alone, races along at approximately 60,000 mph. How can Pluto affect the Earth from a distance of billions of miles away while the Earth is moving so rapidly? Sure, the effect is minuscule, but it's still there, and that's the issue. Why?

The wonder of gravity increases when we consider that enormous galaxies, whose diameters are measured in light years, and which are themselves moving at even higher speeds, can also be controlled by Newtonian gravity. This force which pervades, as far as we can tell, the entire universe, remains unexplained. The basic argument remains, as before, how can one galaxy's mass influence the motion of another galaxy light years away? There are many scientists who have analyzed the Big Bang and who have tried to determine if the mass of the known universe is enough for Newtonian gravity to then reverse the process, and cause the entire universe to crash together and perhaps explode again? Some have suggested that we live in an oscillating universe which undergoes gigantic explosions at regular intervals. And the single force which is thought to cause this entire process is Newtonian gravity.

The question is not whether gravity exists. The question is how it can operate at a distance. Dr. Tom Van Flandern, a former astronomer from the U.S. Naval Observatory, is one of the more prominent astronomers of our time who has recognized that the problem remains unsolved. Van Flandern believes that Newton was well aware of the problem. Van Flandern quotes this comment which he attributes to Newton:

> That one body may act upon another at a distance through a vacuum without the mediation of anything else. . . is to me so great an absurdity, that I believe no man, who has in philosophical matters a competent faculty for thinking, can ever fall into.[2]

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I most definitely hope that Newton said that, but the references I came upon stated the exact opposite. Another book, which deals with the history of science quotes Newton's answer to exactly the same question as being:

> To us it is enough that gravity does really exist, and acts according to laws which we have explained and abundantly serves to account for all the motions of celestial bodies and of our sea.[3]

It is one thing to say that, yes, gravity exists, but we don't know how it works. I can accept that. However I find it hard to accept the Sagan–Leonard answer that, yes gravity exists, but we don't actually care how it works, nor is it necessary for us to know. That seems to me to be nothing more than avoidance of the issue.

For solace, many scientists turn to Newton's formula and state that this tells us all there is to know about gravity. Does a mathematical formula constitute an understanding of the underlying mechanism? How do we know that this formula is valid for all distances? Is it valid for very short distances (e.g. fractions of millimeters) as well as for very long distances (between galaxies)? Does gravity have an unlimited range? Can gravity exert an unlimited force if there is enough mass? Does gravity exert a fixed force of F for each mass of M anywhere at any time? Or can this be modified? (e.g. by passing an electrical current through the mass?). These are serious questions which remain unanswered or badly answered.

Currently, virtually all scientists are slaves to Newton's formula as if the formula is also the explanation. Their ideas of Black Holes in the universe are the direct result of that formula. That formula does not tell us whether there is perhaps a limit to the attractive force of matter. The formula is merely a mathematical construct. When large amounts of matter are brought close together, the formula then produces incredible forces which could cause matter to perhaps be "crushed out of existence" or "crushed into another universe" or something of that nature. But will this really happen?

As any engineer knows, all his formulae are only valid for a certain range of values. Engineers know these ranges. It is extremely important to know these ranges. No thinking engineer would use his formula to predict what happens beyond the ranges for which it is valid. Consider for example, a simple formula which shows how much a wooden plank will sag when you place weights upon it. The formula might require information such as the

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thickness of the plank; and the distance between its supports. If you place an X Kg weight upon the plank it might sag by Y mm. But, what if you place a single grain of sand upon the plank? Will the formula still be valid? Or if you placed that mother-in-law of yours on the plank, will it not break? If your mother-in-law's weight happens to exceed the maximum value for which that formula is valid then there's no telling what will happen. Seriously though, you would know that for all practical purposes some types of experiment are inherently ludicrous and meaningless. And perhaps, to paraphrase Sagan–Leonard, there may be no deeper truth to it than that.

Most scientists are convinced that Newtonian gravity will work for all ranges. It is considered valid for a distance as small as a pin-head and smaller (e.g. inside a Black Hole) and also to be equally valid for the vast galactic distances measured in terms of thousands of millions of light years. It is considered as valid for the "molten core" of the Earth as it is for the Earth's surface. This is a broad brush to paint with, especially when one has never been able to actually test many of these things.

When one deals with extremely small distances, and extremely high densities, then some very bizarre things begin to happen when we apply Newton's formula. Take for example the idea that in a Black Hole, several tons of matter could be crushed into an area the size of a pin-head. Then there's the Big Bang theory which states that all the matter in the universe was concentrated at one point, and that this exploded. However, surely the law of gravity would have instead forced this matter in upon itself thereby crushing the universe out of existence by way of the biggest Black Hole you could imagine—before the big bang could occur?

A scientist might object to this reasoning on the basis that I am bending the rules, because I am applying the law of gravity even before time and the universe began. So let me state it another way. There should be many Black Holes out there in the universe, acting as celestial vacuum cleaners, sucking up matter. There must surely come a day when one Black Hole swallows up another, and eventually these Black Holes will begin swallowing up entire galaxies, and finally when they swallow up everything in the universe? It must be remembered, that as they swallow up matter, so their attractive force becomes ever greater. We assume the reach of gravity to be unlimited. We assume its action to be instantaneous, which seems to me to be a violation of Einstein's theory of relativity. We assume its ultimate force to be unlimited. This lays the foundation for a series of Black Holes to eventually destroy the

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entire universe. Eventually, nothing will be able to withstand the awesome force of gravity generated by this “Super Black Hole”. Does this not mean that ultimately the entire Universe will be crushed out of existence? This logic is the direct result of taking Newtonian gravity to its logical conclusion.

No one can explain how matter attracts matter. No one can explain why it should do this. Nor can anyone tell us the mechanism by which attraction can work at all. Exactly how does one object “pull” on another when there is no apparent physical connection between them? This problem of “action at a distance” bothered other scientists in Newton’s time. Leonhard Euler was one of them.

Let us first look at the development of the theory of gravity and let us examine the underlying concepts. Isaac Newton’s great achievement was in realizing that the force which held the Moon in orbit around the Earth was the same as that which caused a body to fall to the Earth. The law of gravitation which he developed may be expressed as follows: F=G x M1 x M2/R Where:

F = Force

G = Universal Gravitational constant

M1 = Mass of Object 1 R2

M2 = Mass of Object 2 R = Distance between the centers of M1 and M2.

The acceleration of an object due to gravity was found to be approximately 9.8 m/s^2 on the surface of the Earth. Since the distance of the Moon was known, and its orbital period was known (27.3 days), the acceleration due to gravity could be calculated as 0.0027 m/s^2. This figure was 3,600 times smaller than the acceleration due to gravity on the surface of the Earth.

Newton made the daring assumption that the mass of the Earth could be treated as if it were all concentrated at its center. He could then regard the acceleration due to gravity at the surface of the Earth, as taking place 4,000 mi (approximately) from the center of attraction of the Earth. The Moon is approximately 240,000 mi away. The square of the ratio of these distances: $(240{,}000 / 4{,}000)^2 = 3{,}600$. This is in agreement with the ratio of accelerations of a body falling here on the surface, and the Moon.

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One can determine the attractive force between any two particles of masses M1 and M2, which are separated by a distance R. The force, F, will then act along a line joining the two particles. This is expressed mathematically as:

F=G x M1 x M2/R (G is a universal constant having the same value for all R2 pairs of particles.) A University level text book, *Fundamentals of Physics* explains Newton's law of gravity as follows:

> The gravitational forces between two particles are an action–reaction pair. . . (Author's comment: The idea is that M1 exerts a force on M2, while M2 in turn exerts a force on M1. This is what is meant by the term action–reaction pair.) . . . **These forces are equal in magnitude but oppositely directed**. **Note carefully that**, **even though the masses differ greatly**, **the forces are the same**. **Thus**, **if an apple drops toward the Earth**, **the magnitude of the gravitational force of the Earth acting on the apple equals that of the apple acting on the Earth**. **What differs is the acceleration**, **the lighter body having the greater acceleration toward the common center of mass**.
>
> . . . The constant G must be found from experiment. Once G is determined for a given pair of bodies, we can use that value in the law of gravitation to determine the gravitational forces between any other pairs of bodies.
>
> . . . If we want to determine the force between extended bodies, as for example the Earth and the Moon, we must regard each body as decomposed into particles. Then the interaction between all particles must be computed. Integral calculus makes such a calculation possible. Newton's motive in developing the calculus arose in part from a desire to solve such problems. In general, it is incorrect to assume that all the mass of a body can be concentrated at its center of mass for gravitational purposes. **This assumption is correct for uniform spheres**, **however**. . .
>
> **Implicit in the law of universal gravitation is the idea that the gravitational force between two particles is independent of the presence of other bodies or the properties of the intervening space**. **This is consistent with all experimental evidence and has been used**

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by some to rule out the possible existence of 'gravity screens.[4]

On 21 June 1798, these words were spoken:

> Many years ago, the late Rev. John Michell, of this Society contrived a method of determining the density of the Earth, by rendering sensible the attraction of small quantities of matter; but, as he was engaged in other pursuits, he did not complete the apparatus till a short time before his death, and did not live to make any experiments with it. . .[5]

Those were the introductory words spoken by Henry Cavendish, the first man to determine the Earth's mass. The details of Cavendish's experiment have been faithfully recorded for posterity.

The ingenious experiment devised by Rev. John Michell gave us the first accurate measurement of the universal gravitation constant G. Thus by means of the Cavendish balance, and determining the attraction between two objects in a laboratory, we can work back and determine the mass of the Earth which would cause an acceleration of 9.8 m/s^2 on the surface of the Earth. The Earth's mass can be calculated by means of this application of the law of gravitation as: 6.6×10^{21} tons.

Kindly note that this is the one and only method which science has to determine the mass of the Earth. There is no way to cross check this figure at the moment. By making use of the laws of orbital motion we can then determine the relative masses of all the planets. If the mass of the Earth is wrong then so is the mass of every other object in the universe.

The only possible "cross check" so far has been that some scientists have analyzed the makeup of the Earth and the density—and the result is that the mass given by the law of gravity seems "very reasonable." There is something of a chicken and egg problem here because the Cavendish balance experiment has strongly influenced the ideas of seismologists about what the density of the Earth should be below the surface. The extent of this influence will be seen later.

In recent years scientists have estimated the density of the "crust" of the Earth. They have taken the masses of the continents, oceans and even the atmosphere into account and determined that the surface density of the Earth is 2.7 times that of water. Cavendish's experiment however informs us that the average density for the entire Earth is approximately 5.4 or 5.5 times that

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of water. There is no error in Cavendish's experiment. That experiment has been repeated with more modern and more accurate equipment. The experiment is not flawed by some silly calculation. The flaw, if it exists, must be more fundamental.

When scientists take his figures and try to "re-engineer" a model of the Earth to see what it results in, they then find themselves having to assume a dense core with a density of 8 to 10 times that of water.

Now that they supposedly know the densities and pressures of matter inside the Earth they go on to build seismic models and to map this on to their model. Then, when all this has been done they declare that indeed all is well and that the Earth is indeed a heavy, solid, dense mass.

As I have mentioned, there is something of a problem with this process because the one part of it is dependent upon the other.

EULER'S IMPULSION GRAVITY

In Newton's day some prominent scientists discarded the notion of "action at a distance," because they could not conceive of a manner in which it could be achieved. In those days there were two schools of thought among scientists. The one group, whom Euler refers to as the "English" maintained that gravity was a property inherent in all matter. The other school believed that gravity was caused by something external to objects. The English-speaking world has had an inordinate effect upon all of civilization and science. The "English idea" has therefore become so common-place that many believe this is the only idea that ever existed as far as gravity was concerned. But it is not, so let us sit back and read, in Euler's own words why he dissented with these ideas.

Leonhard Euler lauded Newton's achievement and supported it to the hilt, but he disagreed with the idea that gravity is a "property inherent to all matter." This is what he had to say about Newton:

> In truth, before he [Newton] arose the world was in a state of profound ignorance respecting the motion of the heavenly bodies; and to him alone we are indebted for all the light which we now enjoy in the science of astronomy. It is astonishing to think how much of their progress all the sciences owe to an original idea so very simple.[6]

Euler wrote several letters wherein he examined gravity in all its aspects.

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He defined gravity as: ". . . gravity or weight: It is a power by which all bodies are forced towards the center of the Earth."[7]

Why does gravity force all objects towards the center of the Earth? Could gravity be an external force? Euler believes that a force which exists outside all matter causes gravity. He refers to either "ether" or a "subtle" invisible force. Let us not get ourselves bogged down in the issue of ether. Many scientists of the past believed that all of space contained a "fluid" which they called "ether." This was later disproved when various experiments were done to test Einstein's theory of relativity. The subject of ether is complex and we need not concern ourselves with the experiments disproving its existence. The real issue here, which must not be lost sight of, is that Euler simply uses "ether" as a concept, for a type of matter which is very subtle and which pervades everything. In fact, he states specifically, that it could be ether, or something else which causes gravity. His only proviso is that this matter is invisible, and that it exists all around the outside of all objects here on Earth, and in space.

Euler's reasoning is not obvious, so let me try to explain Euler's reasoning by way of some diagrams. Imagine a universe which is filled with small particles which behave like a gas. The individual "atoms" which make up this gas bounce around. They move at incredibly high speeds and now and then they collide with each other. They often also collide with planets and bounce off them. Let us refer to this as a "universal pressure" which presses against every object. These "atoms" or particles of gas are so small that they can often pass through an entire planet without striking any portion of it. Many of them do however strike the surface of the planets and then bounce off. Less of them penetrate deeper into the planets, and many go right through.

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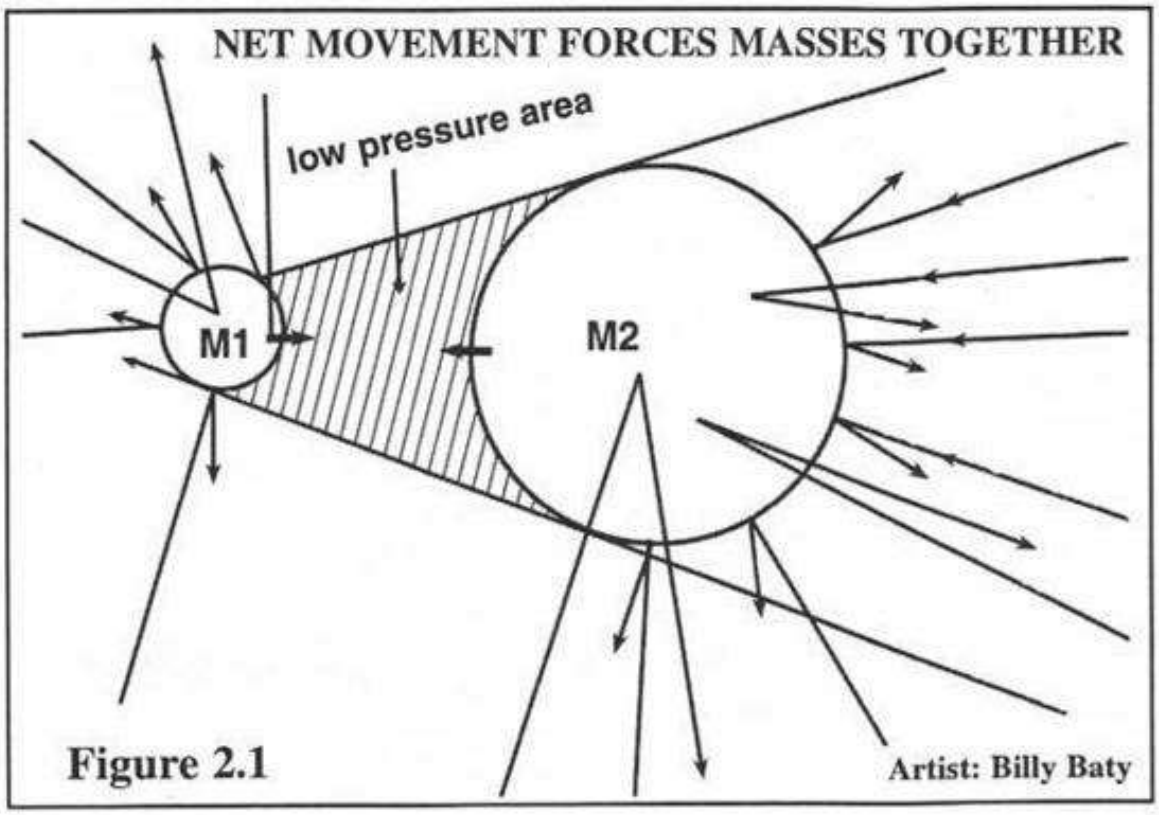

In Figure 2.1 we can see two objects, M1 and M2 which are being struck from various sides by these particles. For the sake of clarity the diagram does not show all the possible paths and angles from which such particles would strike. Imagine these particles coming from all angles and striking both objects in every way possible. The net result would be that there would be one region where less of these particles reach than anywhere else. This is the shaded, low-pressure zone. Each object would "shield" the other object from some of these strikes. The result would be that each object will then be pushed towards the other. Each object would move directly towards the center of the other. It does not matter how they are placed with regard to each other. They will always move directly towards the center of the other. In fact, as they approach each other they will accelerate because they fall into a larger portion of one another's shadow. This can be proven to be consistent with the inverse square law.

This is conceptually what Leonhard Euler is getting at. When one examines this model, it then explains all known aspects of gravity and also enables us to deduce a few additional facts too. This explains, for example, why objects cannot shield each other from gravity. The reason is that it is the

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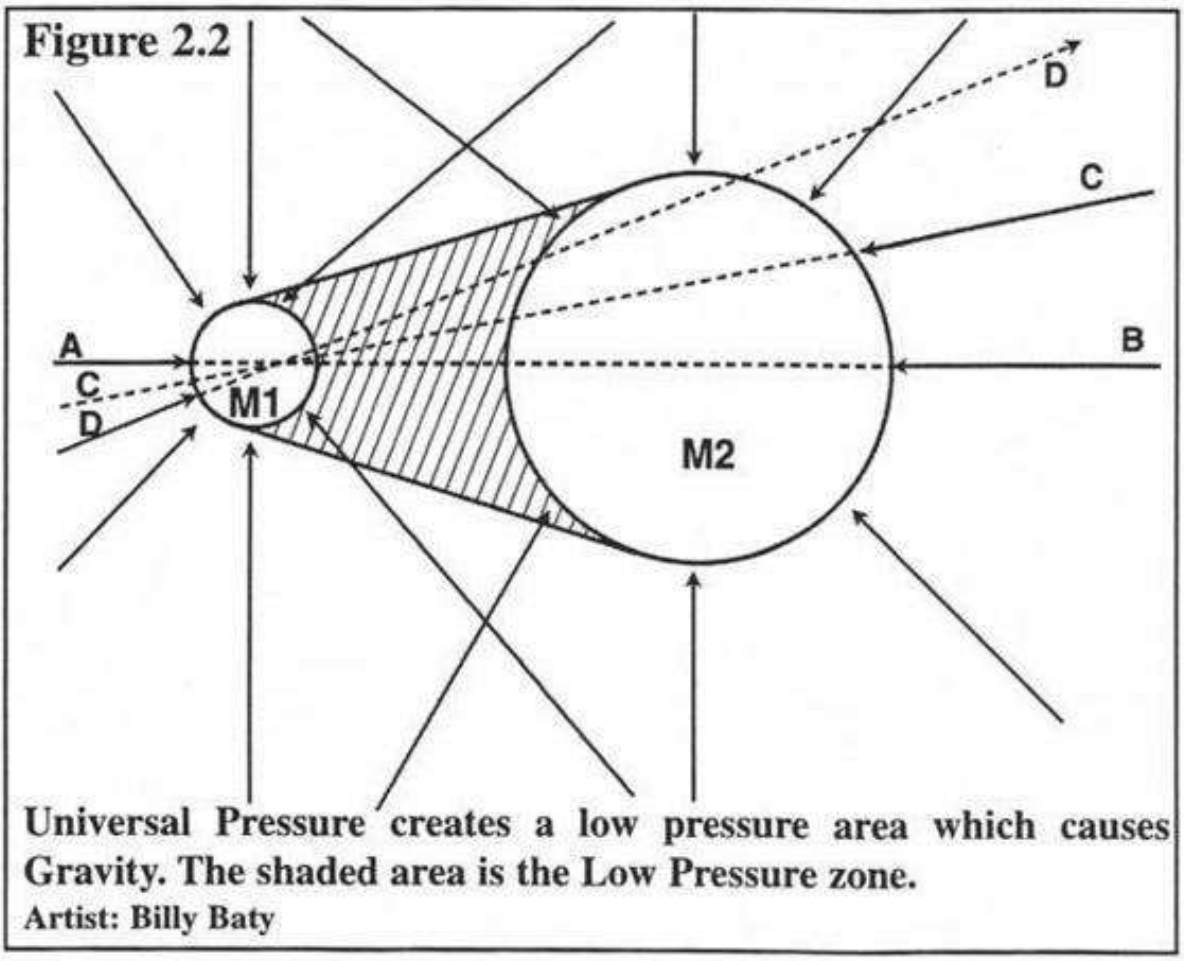
shielding which causes gravity in the first place. Some people think in terms of "gravity waves" emanating from an object and then wonder what would happen if a third object were placed between M1 and M2. They wonder if a third object would interfere with these "waves." But what they do not realize is that gravity is a negative effect. This fact alone should be a clear indication that the force which causes gravity is external to the object.



Let us consider the same problem from a slightly different perspective. Imagine the same objects, M1 and M2 being struck, not by single particles, but by huge volumes of them, coming in "streams." In Figure 2.2 we can see a number of such streams. The low pressure zone is not devoid of particles. It simply contains less of them than elsewhere. For example, if M1 were the Moon and M2 were the Earth, then the ocean would rise up beneath the Moon because of its "attraction." What would happen is that the ocean directly beneath the Moon would not be subject to the same level of pressure

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as the ocean on the other side of the Earth. This is because of the Moon acting as a shield, and hence it appears to “attract” the water.

If we consider streams of particles moving together we can then deduce a few further facts. Stream A can be seen entering M1. Suppose a “stream” were to consist of a million particles. Some of these particles will strike and bounce off matter on the surface of M1. So less of them will penetrate M1. Of those which penetrate M1, some more will bounce off of atoms inside M1. And so on. The “stream” thus loses more and more of its particles as it penetrates the object. But since they are so small, most of them will penetrate M1 and manage to exit the other side of M1. However, we can deduce that the number which exit M1 will be slightly less than those which entered it. They may go on to strike M2 and also lose more of their number to reflection as they penetrate ever deeper. The numbers lost may in fact be small, and this is what will cause gravity. So of the 1,000,000 which entered M1, perhaps 950,000 made it all the way through M1.

Let us suppose that stream A and stream B consist of the same number of particles. Let us suppose that M1 and M2 have the same density. There will be more particles from A, which manage to penetrate M1, than there will be from B which manage to penetrate M2. It follows therefore, that the force with which stream A, strikes M2 will be greater than the force with which stream B strikes M1.

It was said earlier that the apple exerts the same force on the Earth as the Earth exerts on the apple? Well, it may or may not be true, and the only way to know would be to study a model such as that in Figure 2.2. This same Figure 2.2 will give the Reader an idea of how a small object, such as a person is pressed on to the surface of the Earth.

The model is simple, eloquent, and explains every known feature of gravity as we understand it. The only thing missing is the “ether.” We have never found a way of proving it exists. It might even be the most common matter/particle/radiation in the universe. Euler writes:

> **[The existence of gravity] is incontestable; but it has been made a question, whether we ought to give it the name of impulsion or attraction. The name undoubtedly is a matter of indifference, as the effect is the same**. The astronomer, accordingly, attentive only to the effect of this power, gives himself little trouble to determine whether the heavenly bodies are impelled towards each other, or whether they

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> mutually attract one another; and the person who examines the phenomena only is unconcerned whether the Earth attracts bodies, **or whether they are impelled towards it by some invisible cause**.

Euler defines the nature of the matter which must surely cause gravity:

> But in attempting to dive into the mysteries of nature, it is of importance to know if the heavenly bodies act upon each other by impulsion, or by attraction; **if a certain subtle invisible matter impels them towards each other**; or if they are endowed with a secret or occult quality, by which they are mutually attracted. On this question philosophers are divided. Some are of opinion, that this phenomenon is analogous to an impulsion; **others maintain**, **with Newton**, **and the English in general**, **that it consists in attraction**.

Euler makes it very clear that "the English" in general, and Newton specifically, believed that gravity was a "property" inherent to all matter. Euler continues:

> It must be observed, that the terms 'attract' and 'draw' are not perfectly synonymous; that accordingly it is not to be supposed there is an intermediate body between the Sun and the Earth.

Euler was an even tempered fellow, but would often say condescending things which are quite humorous:

> **The English**, **and those who have adopted the same opinion**, **explain it in this manner: they maintain**, **that the quality of mutual attraction is proper to all bodies; that it is as natural to them as magnitude; and that it is a satisfying solution of the question**, **that the creator willed this mutual attraction of bodies**. Had there been but two bodies in the universe, however remote from each other, they would have had from the first a tendency towards each other, by means of which they would have in time approached and united. Hence it follows, that the greater a body is, the more considerable is the attraction which it exerts upon others; for as this quality is essential to matter, the more of it anybody contains, the greater is its attractive force.[8]

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Euler continues:

> It has already been remarked, that, from actual observation, it was found that a lofty mountain in Peru had produced attraction, [on a plumb line,] though indeed a very small degree. A mountain still greater would produce, therefore, a more sensible attraction; and a body much greater, such as the whole globe, would attract others with a force proportionally greater; and this force would be precisely the gravity with which we see that they are actually impelled towards the Earth.
>
> According to this system, then, the gravity which obliges all bodies to descend is nothing else but the result of the attraction of the whole mass of the Earth.[9]

What causes attraction? Euler wrote:

> It now remains that we inquire into the cause of these attractive powers; but this research belongs rather to the province of metaphysics than of mathematics. I dare not therefore flatter myself with the prospect of absolute success in the prosecution of it.
>
> As it is certain that any two bodies whatever are attracted to each other, the question is, What is the cause of this attraction? **On this point philosophers are divided**. **The English maintain that attraction is a property essential to all the bodies in nature**, **and that these bodies**, **hurried along by an irresistible propensity**, **tend mutually to approach**, **as if they were impelled by feeling**.

Harsh words follow:

> **Other philosophers consider this opinion as absurd**, **and contrary to the principles of a rational philosophy**. **They do not deny the fact: they even admit that powers exist which are the causes of the reciprocal tendency of bodies towards each other: but they maintain**, **that they are foreign to the bodies; that they belong to the ether; or the subtile matter which surrounds them**, **and that bodies may be put in motion by the ether**, **just as we see that a body plunged into a fluid receives several impressions from it**. Thus,

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> according to the first, the cause of the attraction resides in the bodies themselves, and is essential to their nature; and **according to the last**, **it is out of the bodies**, **and in the fluid which surrounds them**. **In this case**, **the term attraction; would be improper; and we must rather say that bodies are impelled towards each other**. **But as the effect is the same whether two bodies are reciprocally impelled or attracted**, **the word attraction need not give offense**, **provided it is not pretended by that term to determine the nature itself of the cause**.
>
> To avoid all confusion which might result from this mode of expression, it ought rather to be said that bodies move as if they mutually attracted each other. This would not decide whether the powers which act on bodies reside in the bodies themselves or out of them; and this manner of speaking might thus suit both parties. Let us confine ourselves to the bodies which we meet with on the surface of the Earth.
>
> Every one readily admits, that all these would fall downward, unless they were supported. Now, the question turns on the real cause of this fall. Some say that it is the Earth which attracts these bodies, by an inherent power natural to it; **others**, **that it**, **is the ether**, **or some other subtle or invisible matter**, **which impels the body downward: so that the effect is**, **nevertheless**, **the same in both cases**. **This last opinion is most satisfactory to those who are fond of clear principles in philosophy**, **as they do not see how two bodies at a distance can act upon each other**, **if there be nothing between them**. **The others have recourse to the divine omnipotence**, **and maintain that God has endowed all bodies with a power of mutual attraction**.

Again, Euler states that the cause of gravity is external. It may be caused either by “ether” or by “some other subtle or invisible matter.” But the guiding principle is that whatever causes it must be external to the object.

The snipes he takes at the “English idea” are quite humorous. By his reasoning, the only hope for the “English” school of thinking that gravity is the will of God because they don’t otherwise have a leg to stand on! Euler makes an important point:

> Let us suppose that before the creation of the world God had created only two bodies, at a distance from each other; that nothing absolutely

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> existed out of them, **and that they were in a state of rest—would it be possible for the one to approach the other**, **or that they should have a propensity to approach? How could the one feel the other at a distance? Whence could arise the desire of approaching? These are perplexing questions**. **But if you suppose**, **that the intermediate space is filled with a subtle matter**, **we can comprehend at once that this matter may act upon the bodies**, **by impelling them: the effect would be the same as if they possessed a power of mutual attraction**.

Euler's point above is much more subtle and accurate than one may appreciate at first glance. If there were only two objects in the entire universe, regardless of their distance apart, how would the one "know" that the other is there? How would they move towards one another by attraction alone if there wasn't some other transmitting medium? What is attraction? He is asking for a "mechanistic", "atomic-level" explanation. I agree with him that there really is nothing that one can offer as an explanation, except to presume that something is pervading the universe, and that this force is pressing and pushing the objects towards each other. There really is no other alternative.

Euler asserts that an "ether", whose actions we do not fully comprehend is the only alternative:

> Now, as we know that the whole space which separates the heavenly bodies is filled with a subtle matter called ether, it seems more reasonable to ascribe the mutual attraction of bodies to an action which the ether exercises upon them, though its manner of acting may be unknown to us, rather than to have recourse to an unintelligible property.

Euler asserts that "attraction" amounts to nothing more than wishful thinking. His logic below is not only hard-hitting but humorous:

> Ancient philosophers satisfied themselves with explaining the phenomena of nature from qualities which they called occult, saying, for example, that opium causes sleep, from an occult quality, which disposes it to procure sleep. **This was saying just nothing**, **or rather was an attempt to conceal ignorance**. **We ought**, **therefore**, **likewise to consider attraction as an occult quality**, **in as far as it is given for a property essential to bodies**. **But as the idea of all occult qualities is now banished from philosophy**, **attraction ought not to be**

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> **considered in this sense**. 18 Oct 1760.[10]

His closing words in the above letter are very harsh, and he is saying that the idea of gravity as a “property” of bodies is actually unscientific.

In a letter which dealt with the motion of bodies, Euler again raises gravitational issues. This time he explains that bodies cannot move by their own volition. They can only move when impelled by something external, therefore, gravity cannot be a property inherent to a body. As can be seen, Euler’s arguments are based directly upon Newton’s laws of motion:

> Let a body then be alone, and at rest; it may be asked, Will it continue at rest, or will it begin to move? As there is no reason which should incline it to move to one side rather than to another it is concluded that it would remain always at rest. The same thing must happen on the supposition of the existence of other bodies, provided they do not act on the body in question; hence results this fundamental law: When a body is once in a state of rest, and nothing external acts upon it, it will remain always in that state **and if it began to move**, **the cause of motion would be out of it**, **so that there is nothing in the body itself which is capable of putting it in motion**. **When**, **therefore**, **we see a body which has been at rest begin to move**, **we may rest assured that this motion has been occasioned by an exterior power**, **as there is nothing in the body itself capable of putting it in motion; and if it were alone**, **and cut off from all communication with other bodies**, **it would remain always at rest**.

With regard to the hypothetical example of a stone hanging on a string, Euler writes:

> They say, further, that gravity may be an intrinsic power, attached to the nature of the stone; on which it must be remarked, that gravity is produced either by a subtle matter or by the attraction of the Earth. In the first case, it certainly is that subtle matter which causes the descent of the stone; in the second, which appears favorable to our opponents. **It can with no propriety be affirmed that the stone descends by an intrinsic power; it is rather the Earth which contains the cause of it**, **and which produces the descent of the stone by its attractive power; for if the Earth did not exist**, **or were deprived of its attractive**

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> **power**, **they admit that the stone would not descend**.
>
> It is certain, therefore, that the cause of the descent does not reside in the stone itself: the cause then is always extrinsic, whether it be in the subtle matter or in the Earth, supposing it to be endowed with an attractive power, as the partisans of attraction pretend. This difficulty being removed, the law which I have laid down subsists in full force—namely, that a body, once at rest, will always remain so; **unless it be put in motion by some foreign cause**. . . **this principle being the foundation of all mechanics**, **it was necessary for me to establish it with all possible precision**. 28 Oct 1760.[11]

As has been demonstrated, Euler and others of the "non-English" school of thinking observed that objects cannot move by their own volition. They must be impelled by something outside of them. They assumed an invisible force was at work, a force which pervaded everywhere in the universe, and everything here on Earth. They regarded it as a "subtle" and invisible type of matter. From a mechanical point of view, Euler could not see a single reason as to how gravity could be a property inherent to matter. I agree completely.

In more than three centuries science has made virtually no progress as far as gravity is concerned. I believe this is because we are still adhering to the "English idea." If we dropped it, we might make some progress.

We will however be meeting up with an astronomer, and a microwave engineer who may be edging closer to redefining gravity. A solution to the gravity problem might yet be in sight, and perhaps we are on the verge of the first great breakthrough since Newton's time.

GRAVITY AND INERTIA

Let us take Euler's reasoning further. Newton stated his First Law of motion in these words: "Every body persists in its state of rest or uniform motion in a straight line unless it is compelled to change that state by forces impressed on it." Imagine a body in space, at rest and unaffected by gravity or any other force. It remains at rest because there are no forces acting upon it. That is the conventional view.

But is this the only possible answer? It might seem to be the simplest answer, yet there is one other possibility. Consider an object which lies absolutely motionless in space. It might also not be moving because there are

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forces acting upon it, equally from all directions. If equal forces press on this object from all sides they will cancel each other out and therefore the object will not move. It would be like a body immersed in water where equal pressures are exerted upon it from all sides. The body would also remain motionless.

These two options (a) Lack of forces (b) Equal forces from all sides are the only two reasons why an object would remain at rest according to Newton's first law of motion. Let us give this object a hefty shove, and it coasts along through space. Newton's first law states that it will continue moving indefinitely at this speed.

Again, if we apply postulate (a) where no other forces are acting upon this object then Newton's first law would be satisfied. But postulate (b) would also work. For if forces were pressing on this object, equally from all directions, then it would also continue to move forward indefinitely.

As the Reader will appreciate, both concepts would work equally well, and are totally supported by Newtonian mechanics. Postulate (a) seems to be the most reasonable of the two postulates, by way of its simplicity only. It is easier to imagine an empty universe than one where an equal force presses from all sides—and this I concede. But maybe we must learn to stop thinking of space as representing absolute emptiness. This is not true because magnetic forces and electromagnetic waves are pervading all of space anyway. So why might there not be other "invisible" forces too?

Now there is a problem which science has been unable to solve. This is the problem of inertia. In practise, all objects exhibit a resistance to motion. This is not mentioned in Newton's first law, but everyone knows about it, and no one can account for it. Why should an object at rest actually resist a force which acts upon it? Inertia seems to be a type of "friction." Inertia could be described as a type of universal friction which exists everywhere.

The existence of inertia seems to point directly to postulate (b) above. An object remains at rest, not because no forces are acting upon it, but because there are forces acting equally upon it from all sides. Thus when one attempts to move this object, there is a slight initial resistance to this motion. If the body was immersed in water and you tried to give it a hefty shove you would find a considerable resistance to motion. This resistance may be due to a type of "pressure differential" induced when one tries to move this object.

The existence of inertia seems to point to the existence of a universal pressure which presses on all objects from all directions. Why this universal

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pressure exists I cannot say. This universal pressure however may be one of the keys required to unlock the mechanical secrets of gravity.

Newton carried out experiments which showed that “inertial mass” and “mass” were the same thing. This makes sense when one realizes that mass itself might be an illusion created by this universal pressure. I am not interchanging the words mass and weight. Mass, like gravity is regarded as an inherent property of all matter, and weight is the result when gravity acts upon mass. Thus the weight of an object will vary according to the gravity of the planet on which it is located, whereas mass is a “universal reality” or constant. What I am pointing out is that mass itself might be a “universal illusion” just as weight is a “planetary illusion.” Mass might be useful as a measure of the “amount of matter”—however, as one considers this more deeply it becomes obvious that even this might no longer be true. Were it not for universal pressure, matter (regardless of the quantity) might have no mass whatsoever. One might say that all the matter in the universe were lighter than a feather—not a valid comparison, but an attempt to get through to the Reader the idea that mass like weight might just be another illusion.

Taken one step further, one could conclude that perhaps there is no such thing as “amount of matter.” Inertial mass might be nothing more than the susceptibility of a type of matter to this universal pressure. The more susceptible it is to this universal pressure, the “heavier” we say it is.

These are deep and fundamental issues with enormous scientific implications. The point of this dissertation however, is to make the Reader aware that inertia might be the solution to the “ether” problem. Euler’s “ether” might be the same material which is causing inertia. It might be causing what we refer to as “mass.” This could be the simple proof that indeed, all of space is filled with an “invisible subtile matter” which pervades everything everywhere.

GRAVITY AS A PRESSURE

There is a little book entitled *Gravity is a Push* by a Mr. Wright who is an American school teacher. Most of Mr Wright’s arguments are laughable. It does nevertheless illustrate how the idea of “gravity as a pressure” has occurred time and again, to scientists and non-scientists alike, as the only reasonable mechanism by which gravity can work.

When I came into contact with the astronomer, Dr. Tom Van Flandern, I

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was to learn that several scientists had suggested over the years that gravity might be caused by some kind of pressure operating throughout the universe. The problem was that no one had been able to formulate a workable theory describing the properties of gravity.

I was told by one Euler scholar, that Euler had attempted to define the properties of "ether" which he believed pervaded all of space. Apparently Euler thought its density should be 100 billion times less than that of air, and its elasticity would be 1,000 times greater than that of air. He believed this could account for the speed of light. He believed it was more resistant and flexible than steel, yet millions of times more "subtile" than air. Euler suggested that light was propagated through space just as sound is propagated through the air.

Dr. Van Flandern has attempted to use the latest scientific knowledge to define the nature of this pressure which Euler believed had to exist—simply because there is no other logical alternative. Van Flandern finally presented his "Pressure" theory of gravity in 1993 in his book: *Dark Matter, Missing Planets & New Comets*. Pressure theory or Impulsion theory—call it what you will, but the concept is exactly the same.

Van Flandern earned his Ph.D. in celestial mechanics from Yale University in 1969. He directed the Celestial Mechanics Branch of the Nautical Almanac Office of the US Naval Observatory. During his career he taught astronomy and was a consultant to Jet Propulsion Laboratory. Van Flandern writes this about the law of gravity:

> Modern physics has come to understand something of the nature of light and sound, of matter and energy, of force and motion. We know that heat is a phenomenon caused by the motion of molecules. Matter is composed of molecules, which are composed of atoms, which are composed of baryons, etc. Forces are understood as something pushing against something else, or as action and reaction. **But our understanding of gravity is at a far more primitive level**. . . **we really know very little at all about the why of gravity**. **This is primarily because of its remarkable properties**, **which seem to defy all understanding**.

Much like Euler, Van Flandern muses:

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> ‘Every two particles of matter in the universe. . .’—regardless of chemical composition, regardless of atomic makeup, regardless of charge or spin or any other property —surely a remarkable thing. ‘Attract each other’—other forces of nature have both attractive and repulsive manifestations, but gravity always attracts. Why?”[12]

Here are Dr. Van Flandern’s ideas. Note the exact similarity to the ideas propounded by Euler so long ago. Logic knows no fashion. Van Flandern knew other scientists had propounded this idea before, but he did not specifically know about Euler. I told him about Euler long after he had written his book. Dr. Van Flandern writes:

> We review the properties of Newton’s Law of Universal Gravitation, and for each property, we ask ‘why?’ **To answer this question we postulate that ‘action at a distance’ in its purest form**, **with no agents passing between the acting body and the affected one**, **must logically be impossible**. But if such agents exist, they must propagate and interact in order to have an effect. Gravity would then be an inverse square force, because whatever propagates spreads out in two dimensions while moving in a third. **If the action of the agents results from collisions**, **then their source must be external to the acting body; because if they came from inside**, **the force of their collisions would be repulsive**. **For gravity to be a ‘universal’ force**, **the universe must be filled with a flux of such agents**. **To affect every atom of matter in a body**, **the agents must be small enough to be able to pass through ordinary matter with ease**. **And the mean distance between mutual collisions of agents with each other must be large compared to the distances separating the acting and affected bodies**, **or the flux would behave like a ‘perfect gas’ and produce no force between separate bodies**. **But if these conditions are met**, **bodies would ‘shadow’ one another from some of this universal flux**, **resulting in a net force toward each other which would behave exactly like Newton’s gravitation**. Some common objections to this type of flux model for gravitation are discussed. We then call the flux particles which give rise to gravitation ‘C-gravitons’ (CGs). We also name the medium through which light propagates the ‘light-carrying medium’ (LCM). . . **inertia**, **or the resistance of bodies**

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> **to changes in their state of motion, may arise from the continuum which defines space, so it may be the same for all forces at all scales. Inertial masses would appear to approach infinity as bodies approach the speed of light only because electromagnetic forces cannot propagate faster than light, and hence, their ability to 'push' approaches zero at lightspeed. Forces from gravitation may have no such limitations if gravity operates faster than light, as we conclude after a short discussion of the properties of media in general. We then note that, operationally, dynamicists are obliged to assume instant propagation of gravity for the equations of motion of bodies to work correctly, even though the light from those same bodies has a significant delay in time of arrival. An experiment using the Sun–Earth–Moon system shows that the direction of the Sun's gravitational force and the direction of its arriving photons at the Earth differ by an angle of 20 arcsec, implying that gravity travels at least 20 times faster than light. But the absence of accelerations of contact binary stars sets the strongest lower limit to the speed of gravity at 10^{10}** times that of light.[13]

For a full treatment of Van Flandern's ideas on gravity I suggest the Reader study the above book. I will however summaries the pertinent points here.

Van Flandern's "sea of particles" idea proposes that gravity is caused by extremely tiny particles (which he refers to as CG's) which behave almost like a gas. I say almost, because if they behaved like a gas there would be no gravity. Van Flandern deduces the nature of these particles by applying all we know about gravity. These particles must travel considerable distances before colliding with each other. This average distance between CG collisions with each other is called the mean free path. Van Flandern estimates the mean free path for CG's to be 2 kiloparsecs or about 10^6 times the size of the solar system.

His estimates in this regard are very interesting, for his theory therefore predicts that gravity operates on "small" objects (i.e. planets, stars and solar systems") while being of little consequence on galaxies which are much larger.

Van Flandern sees these tiny CG particles as "bouncing" either off each other, or off other physical objects, just as the particles of a gas do. The only difference is that these particles are so small that they could easily pass

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through an entire planet without necessarily striking anything in it. They move at a considerable speed, and when no physical objects are in their trajectory, they may on average, travel 2 kiloparsecs before striking each other.

As these myriad of particles bounce randomly around the solar system they strike objects from all angles constantly. While most of these particles may pass through entire planets—others will instead strike a particle somewhere on or inside a planet

Suppose there is a single planet in an empty universe, empty except for these CG's. This planet will be struck equally on all sides by these particles. This planet will however remain motionless because there is an equal pressure pressing on it from all sides. Now place another planet in this universe. Suddenly these two objects will be drawn together mysteriously. The reason for this being that there will be a "shadow area" between these two planets. This shadow area is caused by the "shielding" effect which each planet has—as some particles strike it. The planets are drawn together because of this "low pressure" area between them. Euler's logic is obviously based on a similar principle although it is not clear from his writing.

It may be interesting for us to consider how such a gravity would behave inside a planet. Since these particles exist outside of the planet, it follows that more of them strike the surface of the planet than end up passing through it. Gravity on the surface of a planet would then be caused by the differential in "pressure" between particles moving up from "below" and those striking from "above." There is a certain amount of attrition which would take place as the particles pass up through the planet, and less of them strike from below as compared with those coming down from above.

If Van Flandern and Euler's ideas are correct then our ideas of gravity both inside a planet, and across the Universe will have to be rewritten. My own thinking leads me to support his theory because it is the only explanation of gravity at an atomic level which I know of which makes sense—and which can explain all the observed effects of gravity. Einstein's Theory of Relativity regards the speed of light as an absolute. Newton's Law of Gravity is in violation of Einstein's Theory of Relativity however! And so too is Van Flandern's idea.

Van Flandern explains that in celestial mechanics, scientists treat Newtonian gravity as if its actions were instantaneous. They have no choice actually, or else the mathematical results will be different to what is observed.

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Light from the Sun takes 8.3 min to reach the Earth. During that time the Sun has moved 20 arcsec across the sky. When scientists consider the gravitational effects of the Sun upon the Earth they do not calculate these affects according to where the Sun was 8.3 min ago, but according to where the Sun is now. They are therefore assuming that the transmission of gravity was instantaneous—and that the "gravity waves" arrived long before the light from the Sun arrived here. Van Flandern writes:

> If gravity propagated at the speed of light, it would act to **accelerate the orbital speed of bodies**. **By observation**, **no such acceleration exists down to the level of about 1 arcsec per century squared for the Earth's orbit**. **The absence of the acceleration implies that the gravitational lines of force arriving at the Earth are not parallel to the paths of its arriving photons**, **but rather have directions which differ by about 20 arcsec**. **This is true for any model of gravitation**.[14]

Eddington pointed out the same problem with regard to the Sun and Jupiter back in 1920 in his book: *Space, Time & Gravitation*. Van Flandern's comments are relevant because they expose this contradiction which exists between two dearly held theories in science. Newtonian Gravity—and indeed any gravity seems to defy Einstein's theory of Relativity.

This contradiction is remarkable. They can't both be right in this instance. So which one is wrong? Van Flandern writes:

> Perhaps contact binary star systems place the tightest constraints on a lower limit to the speed of propagation of gravity. Unless the speed of gravity exceeds 10^{10} times the speed of light, such systems would fly apart within a few hundred years. Moreover, since the centers of mass of the two nearby massive bodies are accelerating. . . we know from such examples that even the response of a gravitational field to an acceleration. . . of its source body must propagate faster than light.[15]

Van Flandern thus sets the lower limits for the speed of gravity as being at least 20 times the speed of light or perhaps even as high as 10^{10} times the speed of light! The Reader may be wondering how this will affect our understanding of Newtonian gravity—if this turns out to be correct.

Newtonian gravity is accurately measured and proven within the bounds of the solar system. However, Newtonian gravity remains untested in other

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areas. All we have is a formula. This formula has been used to determine the mass of the Earth. This is based on the concept that for each mass of M, inside the Earth, it exerts an attractive force of F. We do not know the valid range for Newtonian gravity. Inside Newton's formula is G. G is the "Universal Gravitation Constant". This is a very interesting concept. It is assumed —and assumed is the correct word here—that each mass of M, exerts the same force of F, regardless of where in the Universe it may be placed. It is also assumed, that each mass of M, exerts the same force, F, whether it lies on the surface of the Earth or whether it be deep inside the Earth. The assumption here is that 1 kg of mass exerts the same force regardless of where it is located in the universe.

I say this is an assumption for the simple reason that we have never had the technology to test this idea —either deep inside the Earth, or in places far from the Earth. When using the Cavendish balance to determine the mass of the Earth, it is assumed that each particle exerts a fixed force upon all others. But if Van Flandern's ideas turn out to be right, then particles near the surface of a planet might exert a force greater than those deep down.

Is the Cavendish balance experiment based on sound concepts? Let us reflect on this for a moment. G is an unknown constant and that is why we need to conduct the Cavendish balance experiment. We take two lead balls whose mass we know exactly, and we measure the force which they exert on each other. From this we can then calculate G. We are however making some interesting assumptions. We are taking these balls, and ensuring that there are no electric currents or static electricity or magnetism which affects them. Then we calculate G. But, how can we be sure that the inside of the Earth is exactly as inert as these two objects? In fact, the opposite is true and scientists expect the inside of the Earth to be electrically conducting.

This experiment is conducted inside the Earth's gravitational and magnetic fields. Is the experiment therefore truly a valid reflection of the effects of a universal pressure? Doesn't the presence of the Earth itself, its magnetic and gravitational fields perhaps distort such a pressure here on the Earth's surface? Doesn't this then render the results of the Cavendish experiment null and void? We are assuming that all the conditions which are valid for those two lead balls are equally valid for entire planets.

The key to all of our gravity is the mass of the Earth. If the mass of the Earth is wrong then so are our estimates for those of other bodies. If the mass of the Earth has been overstated, then it follows that the masses of all other

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bodies in the solar system have also been overstated. If the Earth is hollow, then so too is every other planet in the solar system.

If gravity is caused by an external force then it follows that the attractive force of each particle inside a body will vary with depth. Since some CG's will be reflected off the outside of the body it means that less and less will reach lower depths. It follows that the force exerted by each mass, M, inside the planet will vary with depth. Exactly how it will vary remains to be seen.

I asked Dr. Van Flandern whether the density of the CG's in the universe would be constant. It occurred to me that if CG's cause gravity, then the density of CG's might vary in different parts of the universe in the same way that atmospheric pressure varies from place to place and from time to time. Is Newton's "G" really, universal? Is it really constant everywhere? I see no reason why it should be. I posed other questions to him, to which he also replied to by e-mail on 2 Nov 1997 as follows:

> Question: You mention that current calculations assume the propagation of gravity to be instantaneous. Einstein's Theory of Relativity limits the speed of anything to the speed of light. You estimated the propagation of gravity at many times the speed of light. I found this fact very interesting. Has anyone contributed any further evidence in support of your theory in this or any other regard?
>
> Answer: Several physicists have taken note lately. One laboratory experiment in Switzerland has also obtained faster-than-light results, but the authors are reluctant to publish it until studying all possible sources of systematic error.
>
> Question: Does 'G' really need to be a constant? Couldn't the density of the 'gas' which causes gravity actually differ in different regions of the universe?
>
> Answer: Most definitely, that is true."

STRANGE GRAVITY

Pendulums have been used extensively to measure the strength of gravity. They respond to any forces which are acting upon them. They are

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extremely sensitive to any changes in gravity. By timing the swing of a pendulum one can calculate the force of gravity acting upon it. If the pendulum swings faster, by even a fraction of a second, one can calculate the increased force of gravity which is driving this. Consequently, if the pendulum swings more slowly than the gravitational force acting on it has decreased. The experiments I am going to refer to were done with pendulums which were kept swinging for long periods of time. Their swings were timed accurately by electrical means. As the pendulums swung for hours, days and weeks on end a pattern was thus traceable. These sophisticated pendulums produced results which are totally at variance with the current theory of gravity.

It started in the 1950s when a French scientist reported the strange behavior of his pendulum. Maurice Allais used a pendulum, suspended on a ball and resting on an anisotropic support. He found that the force of gravity changed during a single day. He found two cycles: one of 24 hours and another of 25 hours.

Allais found that his results could not be explained by way of: temperature, pressure, magnetism, etc. Since the Moon rises almost 1 hour later each day it would seem that the 25 hour cycle is consistent with the presence of the Moon. However, Allais found that this was not so. The Moon’s actual effects upon gravity can easily be calculated since we know the Moon’s mass and distance with great accuracy. Allais’s results were different to what Newtonian gravity predicts.

A total solar eclipse occurred on 30 June 1954. At this time the pendulum shifted by 15°—as if a sideways “Focault” effect were acting upon it. This was the single most bizarre result of all. This effect was later reversed and the pendulum then behaved normally again. The effects on the pendulum during the eclipse can be seen in Figure 2.3.

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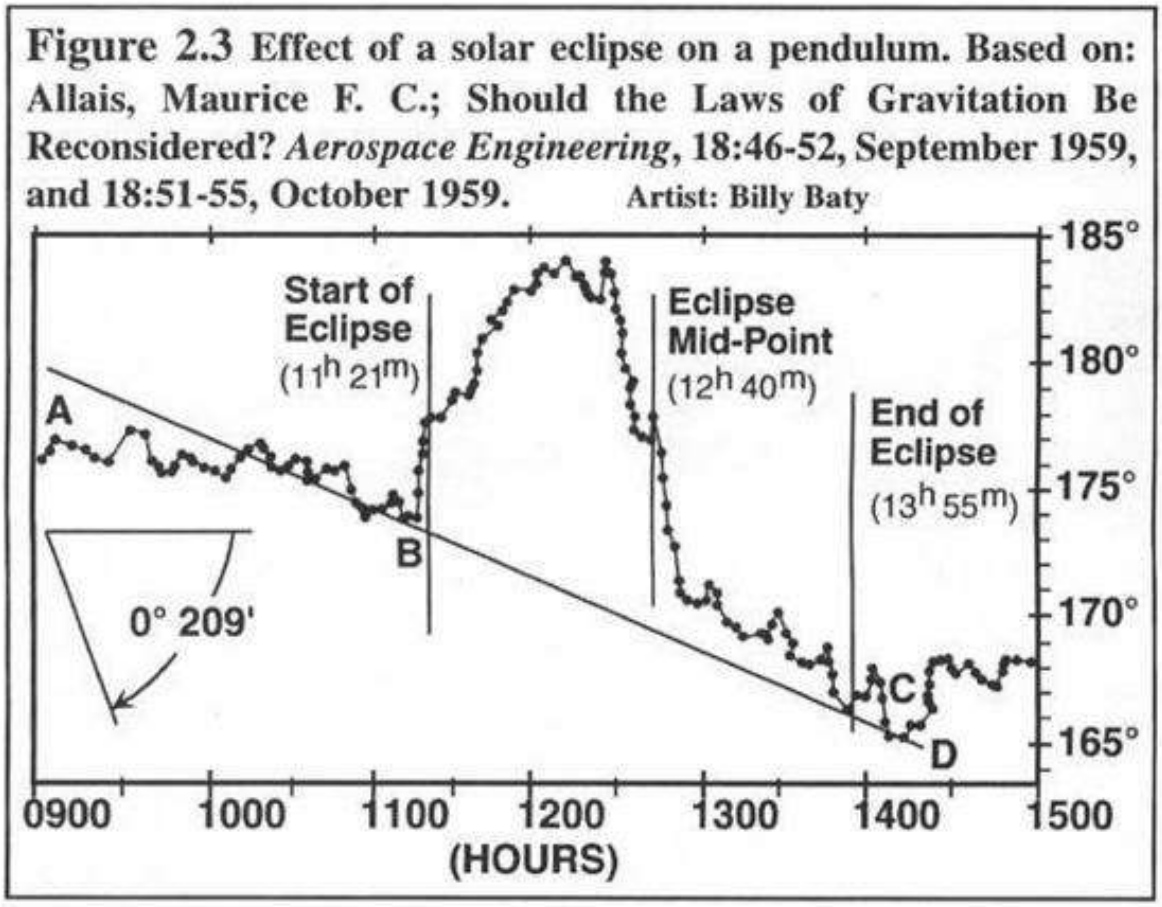

Figure 2.3 Effect of a solar eclipse on a pendulum. Based on: Allais, Maurice F. C.; Should the Laws of Gravitation Be Reconsidered? *Aerospace Engineering*, 18:46-52, September 1959, and 18:51-55, October 1959. Artist: Billy Baty

Allais knew that the results of his experiments were not in accordance with the effects predicted by Newtonian gravity. He wondered if the laws of gravity should be reconsidered.[16]

Time and Period

8:49, 10.028

9:13, 10.028

9:43, 10.024

10:00, 10.019

10:12, 10.020

10:24, 10.024

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10:58, 10.028

On 15 Feb 1981 Allais's experiment was reproduced at Jassy University in Romania. A pendulum of 25.008 m was used, with a bob which weighed 5.58 kg. The pendulum's swings were timed during a solar eclipse. The eclipse began at 08h 49m 03s and ended at 11h 16m 50s. The observations are recorded in the chart to the right.

At 10h 8m the pendulum again swung by 15° as it had done in Paris in 1954. The eccentricity of the resultant ellipse was 0.18. After the eclipse was over, the pendulum again returned to its normal pattern just as it had done for Allais.[17]

Interestingly enough, strange shadows are seen on the ground along the edge of a solar eclipse as well. The current explanation for these effects is somewhat suspect and I suspect there may be a relationship between these effects and the pendulum anomalies. Perhaps these anomalous results are caused by some type of "gravity turbulence" as gravity waves, CG's, ether or whatever you wish to call it "flows" around the Moon—as air does around the wing of an aircraft?

The strange pendulum effects are difficult to reproduce and have never been properly explained. It is totally inconsistent with Newtonian gravity. But while it is spectacular it is not as important as the other discoveries made with pendulums. Dr. E. J. Saxl, from Harvard reproduced these strange solar eclipse results on two separate occasions. The first time was on 13 Mar 1960, and again on 7 Mar 1970.[18]

SATURN'S GRAVITY DEFYING RINGS

Classic gravity works well when we apply it to a handful of individual planets and satellites moving through the Solar system. But when faced with a ring structure such as that of Saturn some very interesting things happen. Among all the recently discovered complexities of Saturn's rings, the dark spokes are perhaps the most challenging to astronomers. Closer examination of Saturn's rings shows them to contain dark "spokes" like a wagon wheel. These dark areas seem to rotate with the rings and are probably regions nearly devoid of the particles. But how could this happen? The "normal" annular gaps between the rings can be explained in part as due to the gravitational influences of Saturn's moons which cause distinct rings to form.

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But the dark spokes are virtually impossible to explain. There are no obvious gravitational nuances that can sweep particles selectively from radially aligned areas.[19]

Several scientists, including some researchers at the Fusion Energy Foundation, have proposed that the complex ring structure of Saturn is caused by a breakdown of Newton's equations. This is similar to what happens in the three-body problem. Scientists have long known that when more than two bodies interact that the gravitational forces create a complex and unstable field.[20] Their ideas are nevertheless based upon a strict adherence to Newton's formula without examining the underlying causes of gravity. I therefore doubt that their solution is correct. Nevertheless, it does indicate that these spokes had a number of scientists quite worried.

There are other problems associated with the rings, including how they could have survived this long unless they are relatively new features. Let me suggest a possible solution which might at first appear silly. What if matter in those rings was "sorted" in some way by the action of gravity? The experiments of a forgotten American scientist from earlier this century might shed some light on what is happening in Saturn's rings.

The idea that gravity might "sort" matter by some logical means has come up from time to time. It first began when Bode noticed that the planets seemed to be spaced out in a rational manner which matched a simple numeric series. That formula became known as Bode's Law. To this day, astronomers wonder if the apparent order in this solar system is by design or not. To ascribe it to mere chance is to make a bet which flies in the face of Probability Theory because so many planetary orbits conform to Bode's Law. In fact, Bode's Law tends to be partially valid even for the Jovian and Saturnian moons as well. Newton's law does not make any predictions about the order of orbiting bodies, and so Bode's Law remains unexplained to this day.

KINETIC THEORY OF GRAVITY

Galileo postulated that objects fall at the same rate in a vacuum. For centuries everyone has been quite happy to accept that all objects, regardless of composition, fall at the same rate. In a vacuum, a feather will fall just as fast as a ball bearing. But if we could measure this to within extremely small fractions of a second, would this postulate still be true?

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In 1910, Charles Brush outlined his *Kinetic Theory of Gravity*. He presented several papers on the subject over a number of years. In April 1923 he presented it at a meeting of the American Philosophical Society. Brush has been totally forgotten by science, and yet his experiments remain as valid today as they ever were. He devised a very clever little apparatus whereby he could drop two samples of matter and determine whether one fell faster than the other, or whether they fell at the same speed. He had two containers wherein the matter to be tested would fall a distance of 122 cm. As each object hit the bottom of the container it would break an electric circuit. Whichever one did so first would produce a bright spark in its container. If they both fell at the same rate then there would be no visible spark in either container. He could not measure the actual rate of fall, but he could tell which, if any of the objects might have a tendency to fall faster. He determined the accuracy of his experiment to be to within 0.0125 mm—which in time amounts to 2.5^{-6} sec.

Using his primitive, but ingenious little apparatus, Brush could conduct experiments the likes of which have not, to my knowledge, been repeated. Brush found that certain materials consistently fell slightly faster than others. Remember, his accuracy was to within 2.5^{-6} sec, and that enabled him to measure it with a considerable degree of accuracy. After a great number of experiments Brush was able to categorize matter by its rate of fall. This is what he discovered:

> Fast: Platinum, Gold coin, Lead, Tungsten (forged), Bismuth, Tin, Zinc, Water, Carbon, Aluminum, Magnesium, Boron, Silicon. Slow: Selenium, Sulphur.[21]

In order to search for the mechanical cause of gravity it is imperative that we study the characteristics of matter closely just as Brush did. His experiments are still relevant today and could be reproduced with ease. In doing so we may find the small but important clues which will enable us to find out what causes gravity and how it behaves. Surely Newton’s formula is not the final word on gravity?

GRAVITY DEFYING GALAXIES

There are a great many spiral galaxies in the universe. When astronomers measure the circumferential velocities of the stars, as they circle

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around the galaxy's hub, they find that all the stars orbit at about the same velocity, regardless of how far out from the hub they are. Their speeds do not drop off with increasing distance, as the velocities of the planets do in the solar system. This observation indicates that the laws of orbital motion have been violated.

Astronomers always expected that the stars rotating around the massive hubs of the galaxies would orbit according to Newtonian principles. Doppler measurements of galaxy rotations made by Vera C. Rubin and her colleagues, at the Carnegie Institution, indicate that most stars, out near the galactic rims, rotate just as fast or faster than those closer to the hub. Astronomers suppose that this anomalous rotation may be due to halos of undetected burnout stars and/or gas fringing the galaxies. Such halos would distort the inverse-square-law field, permitting the observed anomalous rotation.[22] An astronomer, A. Finzi, has already proposed that Newton's law of gravity may break down at galactic distances:

> 1. Introduction. It has been known for a long time that in the great majority of clusters of galaxies the relative velocities of the member galaxies are very large and do not seem, at first, to be compatible with the stability of the clusters. As the reality of this phenomenon seems to have been established beyond doubt, we are confronted with a problem to which no really satisfactory solution has been found so far within the framework of the accepted dynamical laws.
>
> **It should, perhaps, be permissible to consider the possibility that Newton's law may not be valid for distances of this order, as the main experimental confirmation of the law comes from the study of the solar system, where distances smaller by some eight orders of magnitude are involved. Admittedly, we should then be forced to conclude that general relativity also does not apply when distances of the order of 1 kpc are involved. In fact, for the relatively weak fields and low velocities encountered in the study of clusters, the predictions of Newton's law and those of General Relativity are basically the same. The application of General Relativity to the cosmological problem would then not be justifiable.**
>
> It may perhaps be regretted that we do not give an expression for the

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> gravitational force which is valid for every r and which fits Newton's law when r is small. This is due to the fact that we do not know of any astronomical observation from which the behavior of the gravitational force at an intermediate distance can be deduced. On the other hand, we could not have deduced this behavior from theoretical considerations; **in fact**, **equations themselves represent merely an attempt to explain some observational facts**, **and do not claim to have a theoretical foundation**.
>
> If the attractive forces acting between the galaxies are stronger than Newton's law would predict, the large internal velocities in the clusters could be explained. We mention now some other problems which can, perhaps, be solved by introducing the same hypothesis.
>
> 1. The estimate of the mass of the Galaxy, deduced from the motion of very distant globular clusters, is about three times larger than the value deduced from the solar motion.
>
> 2. If one compares the rotational curve of M31 (the great nebula in Andromeda) obtained from radio observations with the curve derived theoretically by Schwarzschild from the distribution of masses, one sees that at a long distance from the center of the nebula the radio curve runs clearly higher than the theoretical curve.[23]

There seem to be many questions regarding the validity of Newtonian gravity at galactic distances.

INVERSE SQUARE BREAKDOWNS

Not many scientists have suspected that Newton's inverse square law might break down at short distances. Such a fact would render the entire concept of Black Holes invalid at a stroke. D. R. Long wrote a paper in *Nature* in 1988 which questioned the validity of Newton's Inverse square law at short distances. Long wrote:

> In a previous paper we pointed out that earlier data on the measurement of the gravitational constant suggest a systematic shift in the value with the separation of the masses.

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Long's "science-speak" above hides the seriousness of the problem because he is saying that G varies according to the distance between the two masses, which is a violation of Newtonian gravitation.

Long went on to mention that the laboratory had been examining this problem for about a year. D. R. Long's experiment was very sophisticated, and was described in great technical detail. They determined the value of G at distances of one foot and less. They used a Cavendish torsion balance to measure the attractive force between two masses. The experiment was conducted in a vacuum.

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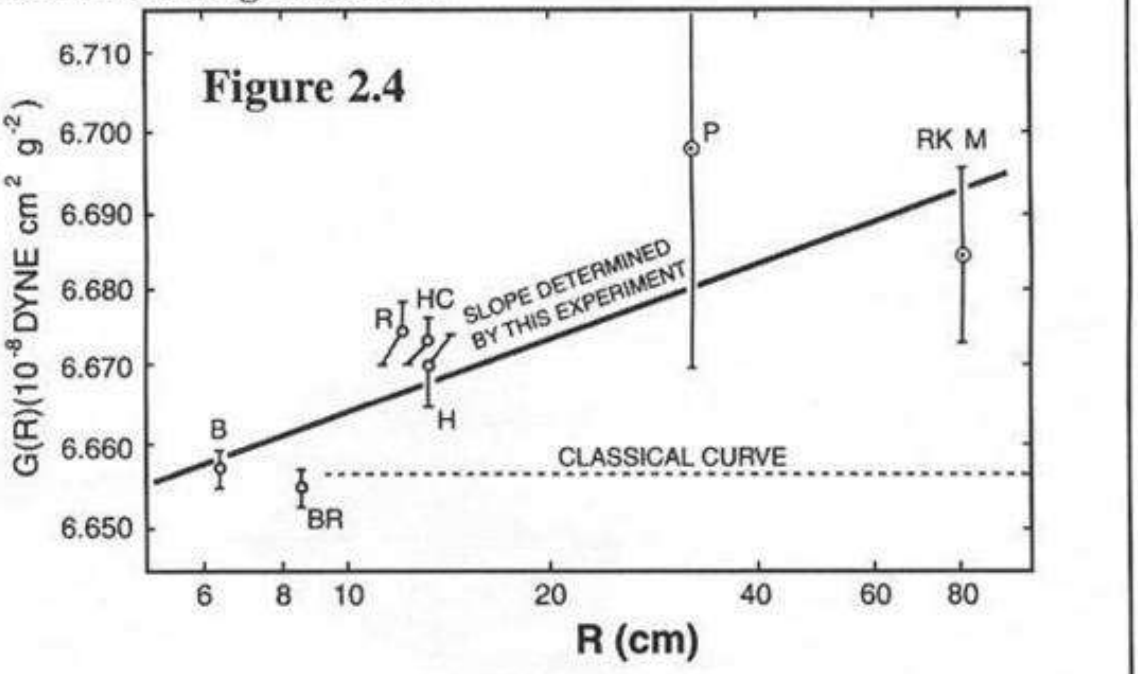

Slope of G(R) from experiment compared with the classical prediction.

In Figure 2.4 we can graphically see the results of the experiments. The dotted line marked "Classical Curve" indicates that G should have the same value regardless of distance. The distances are marked in cm along the bottom of the graph. The slope is a 'best fit' of these results. As can be seen, the slope does not coincide with the dotted line. The results therefore show that the force acting between two objects at short distances does not match that predicted by Newtonian gravity. This is highly anomalous.

Don't think that Black Holes are a proven fact. Several astronomers

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believe they have discovered Black Holes because they detected X-ray sources in the universe. This evidence is far from conclusive, and one should not imagine that Black Holes are a proven fact. These down-to-Earth experiments are of much greater importance and far more provable than Black Holes. Long concludes:

> It should be remarked that while these results indicate an inverse square law failure at small distance, it is also clear that the experiment was carried out in the Earth's gravitational field and we may have in fact, have a failure of the superposition principle.[24]

I find Long's conclusion interesting. Long points out that this experiment may be conceptually flawed because it is conducted in the Earth's gravitational field. But if that is true for this experiment, then the same principle also applies to Lord Cavendish's experiment does it not? That experiment is conducted with the same equipment and using the same techniques—so does that not also imply that his experiment is conceptually flawed?

Surely we can't be hypocritical in science—with a set of double standards? We can't have it both ways surely? So which is it? If the Cavendish balance experiment is valid then it also follows that Newtonian gravity breaks down at short distances. Or is the opposite true? Another experiment was reported at the 1988 meeting of the American Geophysical Union in San Francisco. I quote from the abstract:

> We have performed an experimental test of Newton's inverse-square law of gravitation. The test compared accurately measured gravity values along the 600 m WTVD tower near Raleigh, North Carolina, with upward, continued gravity estimates calculated from ground measurements. **We found a significant departure from the inverse-square law**. . . **at the top of the tower**.[25]

Again, the inverse square law appeared to break down over relatively short distances, but this time using different experimental techniques.

OUTSIDE THE LABORATORY

Virtually all our knowledge regarding Newtonian gravity comes from

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two reliable sources. The one is celestial mechanics and the behavior of bodies in the solar system. Here we can observe and measure the complex interactions between the planets. As mentioned before, we only know their relative masses of course. It is not the relative masses which we are questioning. In attempting to determine the masses of planets in absolute terms, such as kilograms or tons, we need to perform laboratory experiments. Laboratory experiments are considerably limiting in that we can only perform experiments on small objects at short distances. There are four basic forces which are believed to represent all physical interactions in nature. They are:

1. Electromagnetism.
2. The Weak force of Particle Physics.
3. The Strong force of Particle Physics.
4. Gravity.

A. H. Cook from the Cavendish Laboratory in England admits that gravitational experiments, even in laboratories, are fraught with danger:

> **Experiments on gravitation do indeed present the experimenter with a considerable challenge**. **First**, **the forces are very small: The gravitational force between two protons is 10^{-40} of the electrical force**, hence in many laboratory systems the forces are not very large compared with fundamental quantum fluctuations **and have to be measured in the presence of relatively large thermal and mechanical disturbances**. . . The forces of gravitation are very small... When the difficulties of determining the mass of a body weighing more than a few kilograms, and the position of its center of mass, are considered, **they effectively limit experimental studies to masses of a few kilograms and distances of about 0**.**5m**.

Cook tells us that even though the sensitivity of equipment is improving, the experiments must be conducted in an evacuated chamber. It must also be shielded from electrical and magnetic fields and from ground motions. Even so, Cook says, "**yet even with the greatest care**, **inexplicable effects are sometimes seen**."[26] The force which we call gravity is exceptionally weak. It is many orders weaker than static electricity.

Another scientist I spoke to is Jonathan Thornburg of the University of

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British Columbia. In an e-mail dated 29 Mar 1998, he replied in part: “The problem is that the gravitational forces between laboratory-scale bodies are very small, and Cavendish balances to measure them have to be very sensitive, so even tiny perturbations can be a serious problem.”

He went on to warn that many spurious results had been obtained by way of Cavendish balance experiments and that one must be careful of the interpretation of these results. One must therefore understand the extreme difficulties which face the scientists who are trying to solve these problems. The purpose of mentioning these facts is to make the Reader aware of the limitations of our technology when it comes to trying to solve the problems relating to gravity.

Pendulums are highly sensitive to gravity and they have long been used to measure the effects of gravity. It was noticed long ago that mountains seemed to exert an attractive force on pendulums. The masses of the mountains were then estimated very vaguely, and everyone was satisfied with the results. The problem was that such estimates were so vague as to make the final results worthless. Some scientists have begun taking gravity experiments outside of the laboratory. It seems to be a rule of thumb that when theory meets up with reality that we find a surprise is in store for us. The challenge to scientists who have attempted to conduct accurate gravity experiments outside the laboratory is that it is absolutely imperative that they have a very accurate knowledge of the density and geological makeup of the area where they are conducting their experiments.

A number of scientists have been interested in reanalyzing the old Eotvos balance experiments. These experiments had suggested that there is a breakdown of the inverse square law at small distances. These scientists were then looking for a force that is even weaker than gravity and which has been referred to as the Fifth force. This extremely weak force is of no interest to us in this discussion since our line of questioning is much more fundamental. This search for the Fifth force has been the catalyst for these various experiments outside the laboratory.

These experiments have consistently shown that G is much higher outside the lab. Let’s suppose that G is indeed higher outside the laboratory—what does this mean? It is telling us that our mass M, is exerting a greater force of F than we thought. It is telling us that the same amount of matter is, for some unknown reason, exerting a greater attractive force than before. What this boils down to, is that less matter inside the Earth could be capable

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of creating the necessary force which we are measuring here on the surface of the Earth. The implication is therefore that the Earth's density is lower than currently believed. There must be less matter which makes up the Earth. Depending on the results obtained at greater depths, this could be the evidence which shows whether our planet is hollow or not. And, if our planet is hollow, then so are all the others.

In trying to determine the value of G outside the laboratory some scientists hit on the novel idea of trying to determine the value of G in the Greenland ice-sheet. The ice sheet is several kilometers thick, and is of a relatively uniform composition compared to normal ground. In the late summer of 1987 they set out to determine the value G by measuring the variation of the Earth's gravity, g, with depth in the Greenland ice-sheet. The site for the experiment was the radar station at Dye-3, Greenland. It was selected because of the existing 2,000 m deep ice bore hole there. Previous analysis of ice-cores from the bore hole had indicated that the ice density can be accurately modeled. Gravity measurements were made to a depth of 1,673 m in the ice. The sub-ice topography was mapped with high-precision radar echo sounding equipment over a 10 km diameter region, and a series of 24 locations in a 32 km diameter network around the hole were surveyed with gravity, levelling, and GPS positioning.

The scientists believed that the measured anomalies could be taken as evidence for non-Newtonian gravity. They did however state that it could be accounted for in terms of Newtonian physics if a suitable distribution of high density masses existed beneath the borehole.[27]

After the above paper, the different opinions of the research team members were published in an article in Science. Some of them believed that there might be an unusual density distribution of the rock beneath the experiment which could explain the results. But others thought that the required density distribution was too unlikely and contrived and consequently favored a modification of Newton's inverse-square law.[28] The Reader should note that the reason the experiment was done in Greenland was because the ice could be accurately modeled, and therefore there should not be unaccounted masses. In spite of this G was too high.

This high value of G keeps occurring outside the laboratory. Time and again, scientists have tried to explain it away by stating that some "unknown mass" must exist which they were unaware of prior to the experiment. As you can see in the Greenland experiment, some of the scientists thought this was a

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contrived excuse since they had mapped the ice-sheet extremely accurately beforehand.

In 1981, F. Stacey and G. Tuck, from the University of Queensland, Australia conceived another ingenious experiment to test G outside the laboratory. They had noted that scientists were beginning to question the validity of Newtonian gravity at short distances. They thought that accurate experiments outside of laboratory conditions, and over greater distances were needed. Laboratory experiments were confined to distances of 5–100 cm. So they suggested that geophysical experiments at distances of 10–5,000 m should be conducted. They proposed that much more accurate estimates of G outside the laboratory were now possible because density profiles of rocks in various regions were accurately known. In previous times this would not have been possible, but they now believed that there was enough accurate data to make this a viable proposition.

For their first experiment they analyzed sea floor data of the Gulf of Mexico from Exxon. The data covered 1,100 km^2. They found that the value obtained for G was higher than that found in labs. They wrote:

> While the possibilities of systematic errors in these data sets preclude a definite conclusion that Newton's Law of gravity fails at short range, the **strong circumstantial evidence suggests that well controlled large-scale experiments on the inverse square law are urgently required**.

The next thing they did was to summarize a number of determinations of G in mines, bore holes and in marine surveys. All 11 examples they cited resulted in values of G which were greater than lab results. The laboratory value for G was 6.672 $m^3\ kg^{-1}\ s^{-2}$. The value in various mine experiments ranged from 6.724 up to 6.795. The depths at which these experiments were conducted ranged from 57 m down to 948 m. The data from a marine survey resulted in a value of 6.797 at a depth range of 113–687 m.

The deepest experiment conducted, and which is of interest to us, is one in a bore-hole at a depth range of 3,712–3,962 m. Here the value of G was higher than in any of the other experiments. G was calculated as: 6.81. Does G increase with depth? These increases in G may not seem like much, but we must remember that these depths are absolutely minuscule with respect to the Earth's diameter. 50 m and 100 m is less than a pin-prick into the Earth. If we find that G changes consistently and measurably over such infinitesimally

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small depths then something is very wrong with our theory of gravity as it pertains to what lies inside the Earth. The entire science of seismology is based upon these ideas. Stacey and Tuck concluded: "**The evidence of a high value of G is not conclusive but is strongly circumstantial**. . ." They went on to call for more extensive experiments especially on the sea floors.[29]

Dr. G. Tuck continued pursuing these experiments, this time with S. Holding. By 1984 they were able to report back on their most comprehensive experiments to date. In reviewing the work of Stacey and Tuck earlier they stated: "**the striking conclusion was that the values of G [in mines and on the sea floor] were all systematically high.**"

These experiments were conducted in the Hilton Mine. The mine staff had taken 2,300 cores of the area and this gave them a good knowledge of the geological makeup of the mine at various depths. Holding and Tuck thus built up a three-dimensional density profile of the mine from a depth of 183 m down to 993 m—just as the scientists had done on the Greenland Ice Cap. This time they were able to answer those detractors who kept trying to discount such experiments by postulating the existence of some unknown mass in the area. They concluded:

> We are satisfied that inadequate knowledge of density must now be discounted as an explanation for the high values of G calculated here; this is probably true also for some of the earlier values and certainly for the marine measurement. . . our value of G is the best controlled of the geophysical determinations, all of which are higher than the laboratory value. . . although we are not prepared, at this stage, to assert that a non-Newtonian effect is clear and proven, the circumstantial evidence is very strong indeed."[30]

Figure 2.5 is a graphical representation of their results showing the difference between gravity at various depths versus what is expected based on laboratory results. The line connecting the various plots definitely shows that G increases with depth and that it departs more and more from theory. These experiments were conducted at relatively shallow depths of under 1 km. The trend is very obvious and consistent, even at these shallow depths. I can't help wondering what would happen if these experiments were to be repeated in South African mines or even elsewhere in the world?

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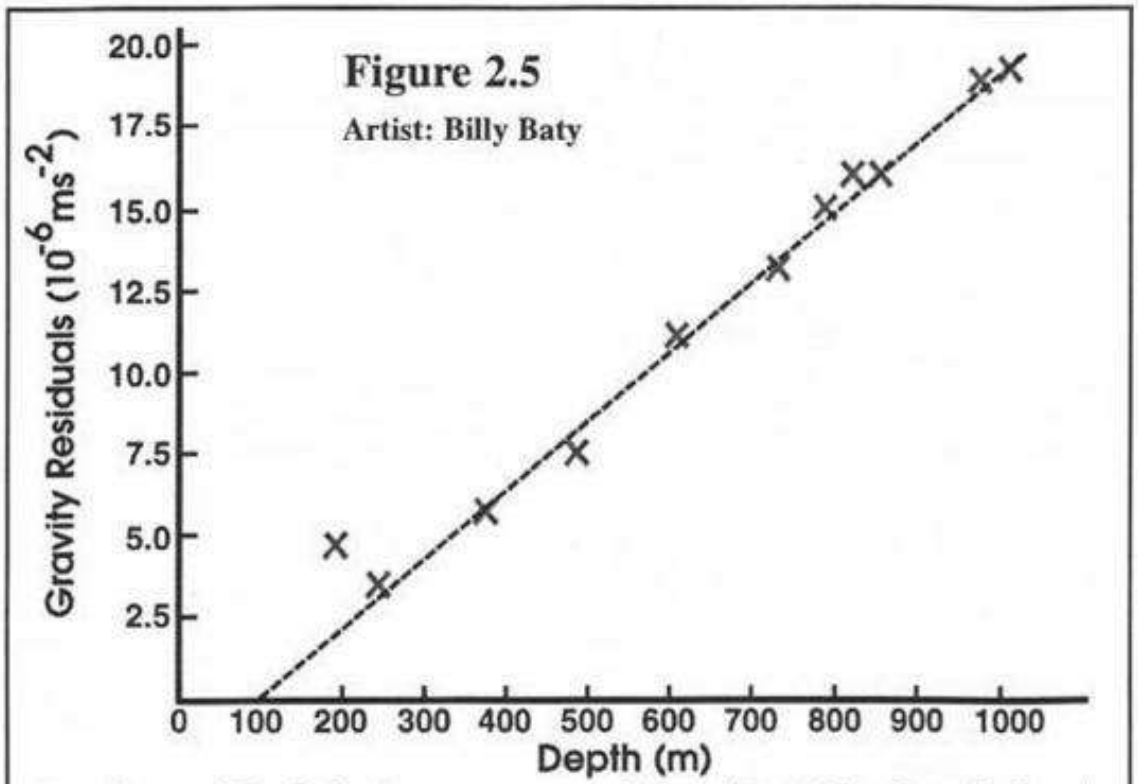

Gravity residuals between measured gravity at depth, relative to the surface laboratory value of G. Based on "a New Mine Determination of the Newtonian Gravitational Constant", *Nature* 309: 714-716, 1984.

The importance of these results must not be underestimated. If they can be confirmed by experimentation, perhaps at deeper levels, it might indicate that the mass of the Earth is much less than has been estimated in the laboratory. Experiments such as these may be the first step in proving that our planet is hollow.

ELECTRICITY AND GRAVITY

When those Cavendish experiments are conducted great care is taken to ensure that there are no electric currents and magnetic fields present. The basic assumption is that what is true for two small lead balls is equally true for the entire Earth. The Earth is however electrically conducting. Electric currents are thought to exist in its core, and we know it has quite a strong magnetic field too. Could electricity also affect gravity? Currently this is not

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believed to be so. I asked Dr. Van Flandern some questions. In his reply of 2 Nov. 1997, he wrote:

> Question: I was wondering too if electricity or something else might enable one to change the effect of these particles and perhaps increase or reduce their effect upon matter?" (i.e. could G be made to vary?)
>
> Answer: Also true in principle—increasing matter density to very high values should allow gravitational shielding. But we are a long way from having such capabilities."

It was not quite the answer I had hoped for, but he did agree that G is by no means a constant. Only one scientist I know of has ever attempted to see if "G" can be made to vary. He is Dr. Erwin J. Saxl of Harvard.

Albert Einstein also worked on a Unified Field theory where he tried to relate various forces together. Dr. Saxl mentioned that he and Einstein had discussions while working together. They discussed the possibility of interrelations between electricity, inertial mass and gravitation. Since gravity is one of the four basic forces, and since it is so exceptionally weak, it has occurred to a number of scientists that perhaps gravity is not really one of the primary forces of nature. Maybe it is only an effect generated by one of the other three? That is what Dr. Saxl and Albert Einstein wondered about.

Dr. Saxl then set out to try to test these ideas. He devised a torque pendulum which he placed in a Faraday cage. The Faraday cage and the pendulum could be charged with an electric current. The pendulum swings were recorded automatically on a chart. For 17 years, from 1953 to 1970, Dr. Saxl experimented with his electrically charged torque pendulum at Harvard. He switched on his torque pendulum at various times to see whether gravity was indeed a static force. Like Allais, he also noted strange patterns. He also charged the pendulum with a DC current. He tried various voltages and charges from -5000 V to +5000 V.

In 1964, Dr. Saxl wrote a paper for the journal *Nature*, wherein he described some of his results:

1. The pendulum would swing fastest when in its normal grounded state.
2. If he passed a DC current through the pendulum and cage, a positive charge would cause the pendulum to swing more slowly.

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3. A similar negative DC current would cause it to swing more slowly than when grounded, but not as slowly as when charged positively. An accompanying graph in his paper showed the considerable consistency in his results.
4. He noted that the effects of these positive and negative charges seemed to vary according to the season. The delay in spring was different to the delay in mid-summer for example.
5. He noted diurnal variations in the pendulum swing time. (Just as Allais had noted).
6. He noted the strange variations produced by both solar and lunar eclipses.
7. He took into account magnetic field fluctuations, temperature, pressure, etc—but none of these could account for his strange results.

Dr. Saxl summarised his thoughts as follows:

> The physicist hesitates to form a working hypothesis for such observations. **Having accounted carefully**, **however**, **for all other influences**, **he is driven reluctantly to the conclusion that there may exist variations in G even if such cannot be noted with grounded**, **quasi-stationary instruments**. **These new effects may become noticeable if geo-gravitic flux-lines are cut dynamically and electrically charged apparatus is used**.[31]

Saxl thus felt that the dynamic nature of the pendulum enabled it to cut through flux-lines and to therefore detect variations in G which stationary instruments could not. That is an important thought. I can find no other references to Saxl's work after 1970.

Have other scientists tried these experiments? Professor Riley Newman of the University of California has been busy making highly accurate determinations of the value of G using a torsion pendulum. In an e-mail dated 22 Oct 1997, Newman informed me that he had never heard of the electrically charged pendulum experiments. Newman discounted Saxl's results by stating that the inside of a metal shield (like the Faraday cage), would never have a truly uniform potential. Newman thus felt that minor variations in the order of hundreds of mV would therefore cause the variations. He is thus blaming the electric current for being "patchy" and for

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its effects on the pendulum being irregular.

But is Newman right? He may be correct in stating that there are extremely small variations in electric current inside the Faraday cage, but can that account for Saxl's results? It's hard to believe that such "patchy" currents could then cause recurring patterns over days, weeks and seasons which are quite consistent for the next 17 years. Surely "patchy" currents would skew the results in a fixed manner? One could not expect "patchy" currents to produce daily, weekly or seasonal variations? That seems quite impossible to me.

Newman also told me that others had tried to reproduce the solar eclipse experiments, but had failed. But why did Allais's experiment, and the experiment in Jassy produce similar results to Saxl's? Newman told me that he had no intention of ever doing such experiments. Yet, as far as I can tell, four documented instances exist of pendulums behaving strangely during solar eclipses by three separate groups of scientists. Did those who could not reproduce the effects look into all the circumstances accompanying the other experiments? Why was Saxl successful on two occasions? For example, there seems to me to be evidence that this strange behavior only occurs in areas of totality or near-totality. "Shadow bands" accompany some solar eclipses. These "shadow bands" seem to be atmospheric waves produced by some kind of "gravity turbulence." There seems to be enough reason to look into this strange phenomenon. The anomalous pendulum experiments I came across all had one thing in common: they were near or in the area of totality where the Moon's shadow blots out the Sun. This seems significant to me because of the many reports of "shadow bands" on the edge of totality. Perhaps the other experiments which failed were too far away from the area of totality?

Jonathan Thornburg had similar reasoning to that of Riley. I asked him if electricity could affect G. His reply in part on 29 Mar 1998 was as follows:

> Conceptually, this is a perfectly reasonable question to ask: are there electromagnetic effects on gravitation. For example, does the effective G of a test mass vary with that mass's electric charge?
>
> Unfortunately, from an experimental point of view, laboratory-scale (i.e. 'smaller than a house') experiments to study this sort of question are horribly difficult and error-prone, and historically several such experiments have produced results which later turned out to be wrong.

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He went on to speak of electrostatic effects, etc which would change and invalidate the results. He spoke of effects similar to those mentioned by Riley. He continued:

> Because of this sort of problem, in general people trying to do Cavendish balance experiments (have to) go to great lengths to avoid any electric charges or currents in their apparatus, and to use very pure non-magnetic materials. So, for example, people usually try to make the suspension wire in a Cavendish balance be electrically conducting (e.g. in one famous Cavendish–balance experiment, Luther and Towler 1981) gold-plated their quartz fiber suspension wire for just this reason) to avoid any build-up of static electricity charges on the test masses.
>
> Of course, this has the side effect (unfortunate for the question you're interested in) that such experiments are also insensitive to any hypothetical electromagnetic influences on G. People who are explicitly looking for such influences obviously use specialized apparatus. I've never seen any papers describing this. . . but I would imagine they use careful electromagnetic shielding to allow (say) the test masses to be electrically charged, but still not be subject to electromagnetic interactions with the rest of the apparatus.

It would appear from Thornburg's comments as if no one has really bothered looking for electrical effects systematically.

Going back to the pendulum experiments, it seems as if neither Allais's pendulum, nor the pendulum at Jassy were electrically charged. Only Saxl worked with a charged pendulum in a Faraday cage. The pendulum at Jassy definitely could not have been charged, for it was 25 m long and had a bob weighing 5.58 Kg. Allais' pendulum seems to have been smaller, along the lines of Saxl's pendulum—yet it was not electrically charged.

So here we have three different pendulums—large, and small; electrically charged and not. Allais and Saxl both took into account temperature, pressure, magnetic field changes, etc. All these pendulums produced a significant 15° deviation during a solar eclipse. Interestingly enough, Saxl's pendulum also produced similar bizarre results a fortnight after the solar eclipse when the Moon was on the other side of the Earth. One can safely say that Saxl's charged pendulum behaved much the same as the

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other two and that also makes one doubt Newman's statements about the Faraday cage.

Both Saxl and Allais' pendulums showed a daily fluctuation in the force of gravity—a fluctuation which is much greater than anything predicted by Newtonian gravity theory. Only Saxl took it further and attempted to determine whether electric current could affect the pendulum. His experimental results were very consistent. Of the three pendulums used, Saxl's one is without doubt the most sophisticated.

Since Saxl was a physicist, I find it hard to believe that he would conceive an experiment which he knew beforehand to be flawed. Newman's criticisms do not explain why Saxl's results were so consistent. Saxl mentioned in his 1964 paper that he had determined the value for each point on his graph at least 50 times. He also took measurements with different voltages in different sequences. He even switched off the current for a time between experiments. In spite of all this, his results were perfectly consistent.

But let's suppose that Newman's criticisms of Saxl are correct. Even so, it still leaves Allais' and Jassy's results unaccounted for. Those pendulums were not electrically charged. Let's suppose Saxl's experiment really was flawed. That would mean that until now, no scientist has ever attempted to see if electric current has an effect upon G. Albert Einstein, Dr. Saxl, and Dr. Van Flandern all expressed the view that perhaps G is not a constant. Why doesn't someone try to devise a better experiment to delve into this issue?

While most scientists might say G is a constant and such an experiment would be futile—I'm not so sure. They would simply be saying so based on theory alone, whereas the reality may be different. There seems to me to be reason enough to expect that many strange things will arise from any such experiments.

GRAVITY AS A FIELD

I found it interesting that Euler's ideas about gravity were similar in principle to what Dr. Van Flandern had come up with. So I told him about it and he was pleasantly surprised by it. Then I mentioned Euler's ideas on the Internet Mathematics news group. A mathematician told me that the concept of a field does away with the need for physical contact between two bodies. I was told that Euler's ideas were simplistic. I however, failed to see how they could simply ignore this "atomic level approach." I don't see how they could

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use the term “simplistic” in such a derogatory manner. It has nothing to do with that. It has everything to do with obtaining a rational, “mechanistic”, “atomic level” explanation which will tell us why gravity operates as it does. This is something we just don’t have. So I asked Dr. Van Flandern what he thought of this answer.

In an e-mail dated 22 Mar 1998, Dr. Van Flandern replied:

> According to Lerner & Trigg’s *Encyclopedia of Physics*, fields are an alternative to treating forces in terms of action at a distance. It says, ‘The field concept is not of much more than philosophical interest; the power becomes apparent only when one assumes that the field obeys mathematical equations governing its evolution.’ **In short**, **when mathematical form and simplicity are taken as more important than the causality principle**, **fields become a preferred way of describing the universe**. **It is still difficult for me to understand how people can think that way without seeing lots of paradoxes**.

So Dr. Van Flandern also did not see how equations could replace the low-level, physical answer.

We are apt to refer to Newton’s formula as the “Law of Gravity” and we begin to imagine that a formula constitutes a full and clear understanding of the cause. But, as I keep stating, no engineer in his right mind would be a slave to his formulae. He is well aware of the limitations of all formulae, and knows the extent its results can be trusted. Why should Physics be any different? As it is, our science is centered upon mathematics, and mathematics does wonderful things for us. But mathematics is only useful insofar as it can model reality. To imagine that mathematics is reality is a whole different argument, and one which I doubt is valid.

NUCLEAR QUANTUM GRAVITY

Am I being unreasonable? Is it too much to ask for a decent, clear, atomic level explanation for gravity? Are scientists really addressing the issue, or are many of them merely side-stepping it? Are we stupid for daring to ask for a clarification of this mysterious “property” which is said to be inherent to all matter?

Perhaps we are not alone. Enter an American microwave electronic engineer who has a special interest in physical science and is an expert in

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Quantum Physics. Ronald Kotas lives in Florida and he has been working on his Nuclear Quantum Gravity theory for the past 30 years. In his paper he writes:

> This concept deals with one of the least known of internal physics, the gravitation force. While its effects and laws have been known since the time of Sir Isaac Newton [1642–1727], **an internal physical and quantum explanation has been lacking**.

In the 1980s he had his theory published in the *International Laser Journal*. He presented it to the Southeastern Physical Society in November 1997, and in April 1998 he presented it to the American Physical Society at their meeting in Columbus, Ohio. His next presentation to the American Physical Society is scheduled for March 1999 in Atlanta, Georgia. In an e-mail he told me that:

> I tried to publish my paper in *Classical and Quantum Gravity Journal* of Great Britain, but their authors are interested only in general relativity and they would not publish the article. They do not want to give a new, different theory, a chance."
>
> One trouble is that General Relativity is like a big dinosaur going along, with octopi riding along its back, connected with fallacious mathematical theories to Einstein's General Relativity theory. **There are so many people involved with General Relativity in some way**, **and they all want credit for linking General Relativity to Quantum Gravity**. **For the most part**, **people use something in space (light bending) to prove General Relativity**. **Nothing here on Earth has produced a definitive experiment proving General Relativity**.

There's no need for me to comment upon his views of General Relativity except to say that I definitely disagree with one of its predictions, namely that the speed of light is the fastest speed an object can travel.

Kotas told me that much more research needs to be done, but due to incidents such as that above, he is finding it hard to obtain funding. Considering all he has done I find this a shame, because his theory seems to have so many revolutionary possibilities as the Reader will come to appreciate. In Kotas' paper he writes:

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> The remainder of General Relativity, which deals with gravity, is mostly a way of applying facile abstract mathematics and non-Euclidean geometry to explain the effects of gravity. That is, curved space or curved line of movement is the easiest way for matter to move and 'space curvature' is what causes 'gravity' with no fields involved.

Dr. Van Flandern also disputes the idea of 'curved space' because for normal "Classic" Newtonian gravity to work mathematically it has to propagate instantly across the solar system. Van Flandern has this to say about General Relativity's explanation for gravity:

> The General Theory of Relativity postulates that gravity is the result of a curvature of space-time in the presence of mass. **But that tells us nothing about why gravity exists in the present context**. **It merely changes the question from 'why do objects attract each other?' to 'Why do masses cause a curvature in space-time?'**[32f]

Kotas quotes *Physics and the Physical Universe*, page 682:

> **Of all our basic theories**, **General Relativity makes the fewest predictions regarding physical effects and has therefore received the least experimental confirmation**. **None of the experimental tests has yet been made in a definitive way—the uncertainty in each of the measurements is disconcertingly large**.

Relativity is based on some pretty thin evidence whereas Newtonian gravity definitely exists in the solar system. The perturbations of Mercury's orbit which were thought to be evidence for relativity have been accounted for quite successfully by the flattening of the Sun and its effects on Mercury. General Relativity is not the only, nor the best explanation for this. Kotas points out other problems with General Relativity:

> Einstein's theory fails the Cavendish experiment. Equations of General Relativity have no solutions in which two bodies of finite size attract each other. According to General Relativity, an apple that became detached from its branch would not fall. Many people realize there is something wrong. General Relativity doesn't have the physics in it that one thinks.

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In a letter to *Classical and Quantum Gravity*, dated 11 Sept 1997, Kotas wrote:

> I would challenge you or anyone else, to provide any Earth-bound experiment such as a large block of steel, or any laser beams that can be bent or distorted in any way, that would prove General Relativity in a real way. It seems that General Relativity has so much inequitable—fallacious inertia, that it is difficult for any to even fairly bring up a competing theory.

It takes a considerable effort to challenge old thinking and to replace it with new ideas. And both Kotas and Van Flandern seem to be busy fighting those very difficult battles.

So what is Nuclear Quantum Gravity all about? In its simplest form, Kotas stated it as: ". . . gravity is the result of alternating currents, dipole, multipole and alignments at the nuclear level." Kotas believes that electrical interactions at an atomic level are causing gravity. His position is very interesting. For his theory may be the unifying idea between widely differing positions. For example, Euler said objects don't move of their own volition, therefore an external force must be impelling them. On the other hand, the "English" school of thinking is that gravity is a property inherent to matter. Kotas' position lies between these two. He believes that matter gives off a radiation at the atomic level. This radiation is too weak to affect the bonds holding the matter together. This radiation spreads out into space at the speed of light or faster. It then interacts with other matter producing the effects which we call gravity. In this manner he can accommodate both schools of thought.

Kotas' theory has an awesome potential because it manages to unify so many different points of view. He believes that electrical reactions between atoms are causing gravity. He suggests that gravity is merely a by-product of the three other basic forces, and not one in its own right. In his letter to *Classical and Quantum Gravity* he also stated:

> Many people, authors of science/physics books, scoff at the idea of General Relativity. If it is truly not in General Relativity where gravity can be, there is only one place it can be, in mass, atoms and nuclei, I would simply ask that you take some of the formulas included in my

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> article, and see if they do work out correctly and with direct coherency.
>
> . . .Gravity is a physical Newtonian electromagnetical coulombic phenomenon **resulting from the propagation of electromagnetic energy between mass**. **It is the resulting force from the inter-reaction between the electromagnetic radiation waves with other particles of the same mass**. **Gravity is not a diverse force from the other three forces**, **but in fact is the same force** manifesting itself profoundly within Newtonian—electromagnetic—coulombic—Maxwell laws. . . **Gravity is a force resulting from electromagnetic energy between masses—the phase coupling to mass particles in the masses resulting in the average thing we call gravity and gravitation**. The radiation between masses produces a direct dipole—monopole phase reaction in the matter causing the masses to attract according to Newtonian Laws.

Here are some excerpts from his paper ***Nuclear Quantum Gravity***:

> ABSTRACT Gravity is an averaged collective electromagnetic type of force. This concept presents that gravity is primarily a quantum, alternating, periodic, electromagnetic type of force, which is a property of all matter based in the nuclei of matter. The force propagates with the speed of light, or greater, and obeys electromagnetic Maxwell Newtonian physical laws. The gravitational force in space is proportional to the amount of matter and inversely proportional to the distance from other matter. . . It is the resulting force from the interaction between the electromagnetic radiation waves with other particles of the mass. Gravity is not a diverse force from the other three forces, but in fact is the same force manifesting itself profoundly within Newtonian—electromagnetic—Coloumbic —Maxwell laws. . . The radiation between masses produces a direct dipole–monopole phase reaction in the matter causing the masses to attract according to Newtonian Laws. . . The force in space propagates as an electromagnetic wave with the speed of light or greater, and obeys electromagnetic, Newtonian physical rules. The electromagnetic quantum wave force reactions in matter propagate at electron speed or greater and have electromagnetic domain properties as well as variance of index of

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> refraction type properties with different types of masses. . .

Kotas mentions other experiments which are supportive of Charles Brush's experiments:

> It has also been shown by the Fischbach study of the Eotvos experiment labeled as a 'Fifth force' that there are indeed variances in acceleration rates of various materials. This was done simply by restudying Eotvos data. I will state that this is a direct manifestation of quantum gravitational variation in mass and a part of the quantum gravitation. These small quantum variations average out to form normal gravity of about 9.8 m/s of acceleration on Earth."

Kotas' above statements are of critical importance. It is important to understand that Newtonian gravity is nothing more than an average when one studies gravity at a planetary level. It is therefore to be expected that on a minuscule level this law will no longer be valid. There will be minute variations over short periods of time, and there will also be "turbulence" factors at these short distances. Kotas is also able to explain why Brush's experiment showed that different materials accelerate at slightly different rates. This is because, at a quantum level, matter is indeed different. He continues: "There are also differences in near field areas of gravity to the far field areas where gravity will have a chance to interact and average out."

Kotas' point is very important. It represents another way of looking at the problem which I described before, that all formulae are only valid within a certain range of values. His explanation gives a clear indication as to why Newtonian gravity will break down over short distances. Kotas tells us more about the possible effects electricity will have on gravity:

> It should also be noted that. . . [electric] currents flowing in one meter long wires with 1m separation between the wires. **The force is attractive when the currents flow in the same direction and repulsive when the currents flow in opposite directions**. **When man learned to manipulate electromagnetism both attractive and repulsive were put to many uses**. **In the case of a gravitational mass such as the Earth**, **gravitational domain currents flow in phase in the mass as a result of the total mass and quantum factors and thus gravity is always taken as an attractive force**. But, it should be

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> pictured that when man and science learn to use electromagnetic energy and manipulate matter, normal gravity will become reversed and controlled in a very useful manner.

Kotas is obviously hinting at the possibility of anti-gravity devices which could further revolutionize our civilization. Some of Kotas' thoughts are very similar to those propounded by Leonhard Euler and Dr. Van Flandern, for example: "Gravity and gravitation is done by an electromagnetic wave that **is mostly transparent to matter**." Does that not sound like "ether" or CG's? He writes:

> Electromagnetism is again not only present in everyday life, but manifestation occurs at Fermi-distances and small to interstellar distances, encompassing virtually all physical phenomenon. Why should we accept that gravity is some kind of odd force, only fallaciously conceptually pictured by distorting geometry? I strongly submit that the three remaining forces are quantum and Grand Quantum manifestation of the same basic force, 'Grand Quantum Electromagnetism.'

With reference to the Big Bang, Kotas states:

> In my grand picture. . . of the physical universe. . . the 'Big Bang' was just a Quantum condensation and a Quantum expansion. . . It, the universe, is here now, has always been and will always be. It just dynamically, grandly, physically quantumly oscillates. . . Black Holes and neutron stars are nothing more than Quantum states of condensed matter to different degrees.

Kotas' formulae are very impressive but far too technical for a work of this nature. There are several of them. His different equations are able to unify several different aspects of physics. One equation relates the Newtonian G, to the atomic mass unit, the nucleus and light speed. Another relates the "Fine structure constant", Planck's constant and Light speed. Yet another relates Planck's constant, Light Speed and Electron Speed. There are several others too. But the most important one appears relatively simple. It is: $2K\ amu = h$

Kotas believes that the above equation deserves a similar respect to Einstein's $E = mc^2$. The above formula states that the electromagnetic force,

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the atomic mass unit (basic unit of mass), and Planck's Constant (basic unit of energy) are all interrelated. Kotas points to experimental evidence which he believes supports his theory:

1. A 1978 Seasat study by NASA showed that water aligns itself around seamounts. Some of the areas are hundreds of feet lower, and hundreds of miles across.
2. In 1973 Bell Telephone Labs levitated small glass balls with an argon laser. The effect was more than was expected from the pressure of light alone. There was no explanation for the effect. In recent years they have levitated spheres and controlled them. Kotas says that this shows that electromagnetism is equivalent to gravitation and has nothing to do with geometry or space being bent.
3. He points to experiments along the lines of those done by Charles Brush earlier this century and says that this is what should be happening because at an atomic level the different materials are indeed different. Hence gravitational effects on them cannot possibly be the same.
4. Kotas supplies additional evidence that the speed of light is not as absolute as Einstein's theory of Relativity would have us believe: "A few years ago, Doctor Ishii of Marquette University, Milwaukee, Wisconsin, using common Hewlett–Packard equipment, demonstrated that microwaves can travel faster than the speed of light, both in a waveguide and in space. The speed is dependent on the cosine of the angle launched, formula No. (27). This would have many profound [implications] in communications as well as insights into Quantum Gravitation. c = c/cos of the angle (27)"
5. He continues with another example: "Recent experiments at the University of California, Berkeley, have shown that photons tunnel through a barrier at velocities considerably greater than the speed of light in a vacuum, **1.7 times**. **So it may be that when light is well away from a gravitating body**, **micro**, **pico**, **or fermi gravity**, **it may well be that light has a much greater speed as opposed to its speed in our solar bubble**."

Kotas' conclusions in this area are extremely fascinating. Not only have I wondered about G being variable, I have also wondered if the speed of light

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is variable. The simplest proof is that the speed of light in a vacuum is 186,000 mi per sec whereas in water it is 144,000 mps. It seemed to me as if the speed of light was regulated by the density of the matter it was passing through. Space is not truly empty as Kotas says. Such experiments and reasoning makes one further doubt the predictions of the Theory of Relativity. This is not bad news. In fact, it is great news because it means that faster-than-light space travel may one day become a reality. There are some red-shift anomalies I came across in my research which made me wonder whether light accelerates across galactic distances. I am therefore quite comfortable with Kotas' thinking.

More humorously, I was once told that the reason light travels more slowly in water is that the density is greater and the light bounces between the atoms in a zigzag path. I was confidently assured that indeed, if one could measure the speed of light in its zigzag path then it would still be 186,000 mps! I could not argue with that. But the above arguments which show that the speed of light can be exceeded, do of course settle the matter for once and for all.

Ron also elucidated his thoughts on the magnetic component of gravity. In an e-mail dated 28 June 1998:

> . . . when you take any common magnet or mass, and cut it in two, the poles do not become a monopole, but simply a North or South Pole on the items cut in two. If you keep dividing the matter until you get down to the size of atoms and nuclei, the magnetism is still there, but changes somewhat to a dynamic form (alternating). All matter has some magnetic properties.
>
> It's normal in nature for magnets to be attracted. They don't like being opposed and will try to flip around, which you can demonstrate in your own hand. I believe one scientist at the Fermi Lab in Illinois told me that gravity had to be something different because it's only attractive. What I told him was that if you had a bushel of magnets sitting on the floor and tossed another magnet at them, the magnet would turn in the air and become attractive to the rest of the magnets in the bushel basket. By that experiment you would have to conclude that electromagnetism only functions in one direction. It's only when man learned to manipulate electromagnetism that attraction and repulsive modes are presently used.

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I asked him various questions and he replied as follows:

> Question: Dr. Erwin J. Saxl of Harvard only used DC currents of up to +5000 V and -5000 V. He found gravity was at a maximum when the pendulums were grounded. He found many gravity variations. His papers were published in *Nature*. Did you ever follow his experiments?
>
> Answer: No, I haven't. But NASA has levitated objects with high voltage plates above and below the object. This required about 16,000 v. It was a feedback system that kept the object levitated with the DC voltage. This has been published by NASA.
>
> Question: Can you explain why his DC currents reduced gravity effects?
>
> Answer: When you get higher voltage or magnetism, this gets down to where the nucleus of the atom is, and that's what affects this.
>
> Question: Any idea how one could increase its effects? I note that you mention gravity is an AC current, correct?
>
> Answer: The DC and AC effects when you go to the atomic structure, atoms of course are dynamic, nuclei are dynamic, so we may conclude that they are dynamic alignments and dynamic properties are what cause gravity.

GRAVITY ROUND-UP

Various scientists have proposed that G varies over long periods of time. I have not mentioned these ideas because they are dealing with minor modifications to G over billions of years. These musings of mine are based on a totally different concept which questions whether G is a constant to begin with. I'm not blaming Newton for coming up with it. It's very understandable that in order to have a conversion factor that a constant such as G was needed. That's quite acceptable mathematical practice. However, it was called the Universal Gravitation constant, and then people immediately adopted that as a statement that G is fixed throughout all the universe, throughout all the planets for all time. But as one ponders this concept it

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becomes evident that these sweeping assumptions are dangerous to make without any supporting evidence.

This is a much more fundamental challenge to the idea and its ramifications know virtually no bounds. If G were to prove to be variable, it then opens up incredible opportunities for us which might enable us to develop entirely new breeds of aircraft and space craft which operate on totally new principles. The implications for space travel are even greater than for aircraft.

Our
are currently too slow to enable us to undertake proper manned missions to the planets or to explore beyond the solar system. Currently we keep thinking in terms of bigger and more powerful rocket engines. Engineers think in terms of nuclear engines which might be able to supply the necessary energy needs. But there may be a simpler solution. If one were to understand what causes inertia to begin with then one might be able to reduce a
’s mass thereby enabling one to achieve incredible accelerations and amazing top speeds. NASA developed workable ion engines in the 1960s. They have a slow acceleration but a very high top speed. It takes months to accelerate an ion powered space craft. But if one could reduce a craft’s mass then ion engines could have a great future.

The ultimate propulsive force might be to harness the pressure of gravity as a source of energy. This might be akin to having an almost free source of energy—like using solar power. It might even give us higher top speeds than ion engines, and maybe one could reach the speed of light—and perhaps even go beyond it. The idea of faster than light travel is regarded as a total impossibility at this time. But it might not be.

The whole basis of this discussion is therefore very revolutionary and fundamental. It questions whether Newton’s formula really constitutes everything there is to know about gravity. I do not believe it does and that Euler’s reasoning needs to be explored further. Euler’s thinking might just take us to the stars!

I asked Dr. Van Flandern what sort of response he had had from the scientific community as regards his ideas on gravity. In an e-mail dated 22 Mar 1998, Dr. Van Flandern replied: “Some like it a lot, and some hate it a lot. Very few have anything of substance to say on the subject, however.”

Ronald Kotas has an idea which deals with the atomic level and which seems to unify all other ideas ever proposed. It seems consistent with many

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Newtonian concepts, and it seems to fit in quite well with various proposals by Euler and Van Flandern. Only General Relativity seems out of place here.

The argument is not to deny Newton and Halley their rightful place in history but to build on what they discovered. What they discovered for the solar system is quite valid. But, what they discovered does not represent the last word in gravity either. Newtonian gravity, as defined by them, seems to be limited to the objects in the solar system only. One needs to therefore expand on it, to include everything inside the planets and everything at galactic distances. Herein lie the complications but also many wonderful opportunities for amazing new discoveries.

Euler and Van Flandern suggest that a specific type of matter pervades the universe. It may be so subtle that we have not been able to detect it. Maybe we did not try hard enough. Why this matter exists is anybody's guess. Kotas makes suggestions which might help to shed light on the issue. He suspects that matter gives off photons which race off into space at the speed of light or greater. Could it be that Kotas' theory shows us where this matter originates from? Could it be that the slight radiation given off by matter is what creates this enormous universal ocean of particles/waves which then cause gravity?

Since the Earth's magnetic field is generated inside the Earth, and since we know that electric currents flow in the Earth—it is likely that, as we get closer to this source of magnetism and electricity, that this will further modify the value of G. Scientists expect the electric currents to be stronger deep inside the Earth. What effect do these electric currents have on G? Perhaps electrostatic force also plays a role? The electrostatic force which acts on two protons is 10^{39} times stronger than the gravitational force which acts on them! Scientists have generally assumed that entire galaxies are electrically neutral.

There are so many variables which might affect the value of G at various points above and below the surface of the Earth that it is impossible to say exactly what happens below the surface of the Earth. I don't see how one can be absolutely certain that its behavior inside the Earth matches that predicted by a slavish application of Newton's formulae. How can we be sure that the Earth really has the mass accorded it by Newtonian gravity? Is an experiment, using two lead balls really representative of the entire Earth? How can we be sure that gravity behaves 1,000 mi down in the Earth the same as it does 10 cm down in a lead ball?

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Science also has its assumptions. There are times when scientists just have to start somewhere, so they make assumptions. How valid are these assumptions? Can we really be sure that G is a constant? Is the Cavendish balance experiment really a valid means of estimating the mass of the Earth? And what of unknown factors?

Let me remind the Reader of one of Kotas' points:

> In the case of a gravitational mass such as the Earth, gravitational domain currents flow in phase in the mass as a result of the total mass and quantum factors and thus gravity is always taken as an attractive force.

Kotas pointed out that electric currents which flow in the same direction will always attract. Scientists are convinced that electric currents flow inside the Earth. These currents almost certainly flow in the same direction. It therefore follows that they will be attractive. Does it not then follow that each mass of M, deep inside the Earth might produce a greater force of F than previously considered? If so, then the Earth's density may be much less than it has been thought of until now.

Over and above this theorizing, we still have the excellent mine, bore hole, ice cap and sea bed experiments which definitely show that something is amiss. Regardless of where G was determined, the value of G increased, even at very shallow depths. All this indicates that less mass produced increased attraction. These could be the initial indications that Earth really is hollow.

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Chapter 3: Seismology and Geology

What do we really know about the Earth's interior and how trustworthy is our knowledge of it?

THE EARTH'S HEAT

Many people, mistakenly, think that the lava which pours out of volcanoes comes from a large reservoir of molten material which makes up the greater part of the Earth. Scientists have discovered that lava comes from within the Earth's crust. The lava comes from approximately 20 mi down. The existence of lava does not affect the passage of earthquake (seismic) waves. This indicates to scientists that the crust is largely solid. So where does the heat come from which melts the rock locally? Scientists have advanced two theories. Some say that the melting is due to high concentrations of radioactive elements in a particular area. These decaying radioactive elements generate enough heat to melt rock. Much lava is slightly radioactive and that lends support to this theory. Other geologists have argued that shearing and faulting are adequate heat generating mechanisms. The evidence supports both theories. Lava cannot possibly be rising from the center of the Earth as some may be tempted to think. It would cool down and become solid on its long, slow journey upwards. There can be no doubt that the lava which drives volcanoes comes from approximately 20 mi beneath the surface of the Earth. Lava is therefore a surface phenomenon and does not in any way reflect what the Earth is like 50 or 100 or more mi down.

In the 19th century Lord Kelvin estimated that a molten Earth would take only a mere 98 million years to cool down to its present temperature. Yet the Earth is supposed to be 4.6 billion years old. The Earth must therefore be generating its own heat.

The Earth's temperature is relatively constant. Where does this heat come from? Most scientists believe it comes from decaying radioactive materials deep inside the Earth. Radium is thought to be the main radioactive material inside the Earth. Radium comes from decayed Uranium. The material we use to produce nuclear bombs and power nuclear power stations. It seems reasonable to suppose that once there was a great deal more uranium in the Earth's crust. There are some scientists who have pointed this out

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already.

The Earth does not seem to be cooling down any further and this should alert us to the fact that the Earth is simply not a ball of molten material which is slowly cooling down and solidifying—as many people believe.

DRILLING TRUTHS

In an interview in 1976, Professor Julian Goldsmith from the University of Chicago expressed the view that travelling deep into the crust was utterly impossible. The problem we face is that as one goes deeper the pressures and temperatures keep on increasing and the solid rock begins to flow. One can therefore never drill a hole beyond a certain depth because one is drilling into something which becomes a semiliquid. It is important to note that because these scientists rule out the possibility of there being large cavities deep inside the Earth's crust. Goldsmith said:

> At a pressure of about . . . (150,000 lb/in^2)—[at a depth of] over 30 km . . . (18 mi) . . . **all the pores or cavities of solid rock close and the hole would squeeze shut**. **There's no way you can maintain a cavity or hole in the Earth deeper than that**. **That's the absolute limit**. **I doubt you could ever send an instrument down even that far**. **We'll never reach the deep Earth—that is**, **anything below 10 mi**.[1]

Goldsmith echoes the views of scientists around the world when he makes that statement. Pressures keep increasing and temperatures do too—eventually everything is virtually a molten, flowing, semi-liquid. That is the view scientists have of the Inner Earth. These ideas are the indirect fruit of Newtonian Gravity as can be seen by this quote from the noted seismologist K. E. Bullen:

> Since the famous experiment of Cavendish in 1799, it has been known that the mean density of the Earth is of the order of 5.5 gm/cm^3. **This figure implies the existence in the Earth's deep interior of material considerably denser than the typical surface rocks**.[2]

When Cavendish conducted his experiments his results showed that the Earth had a density of approximately 5.48 times that of water. At the time he pointed to some experiments conducted by Dr. Askelyne on Schahillien hill

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which resulted in a value of 4.5 times that of water but he did not wish to speculate on which results were the more accurate.[3]

If there is a single crux on which the solid Earth rests, then it is that experiment which Cavendish performed 200 years ago. That experiment in turn is the direct product of Newtonian gravity. Everything in seismology is interpreted based on the evidence of that single experiment. The behavior of seismic waves through the Earth is interpreted (mathematically). The key word here is: interpretation. It follows that if Newtonian gravity does not behave inside the Earth as it is assumed to behave, then the entire edifice of terrestrial and planetary physics could come tumbling down one day.

The deepest mines in the world are virtually on my doorstep here in Johannesburg. Many people imagine the Earth to consist of molten lava deep down. One of the reasons for this belief is that the temperature in mines rise as one goes deeper and deeper. Since the temperatures seem to rise steadily scientists have then extrapolated the temperatures and attempted to estimate the temperature of the Earth hundreds of miles beneath the surface. These techniques are similar to the extrapolations used by the Greeks when they assumed that the climate south of the Sahara continually became warmer. The scientists of today, just like the Greek philosophers back then, believe they have a logical rationale on which to base these extrapolations.

One has to ask oneself whether this extrapolation of temperatures is really logically justified. One should keep in mind that these extremely deep mines here are still nothing but a pin-prick into the surface of the Earth. The center of the Earth lies some 3,963 mi away. A mine six mi deep really does not represent a valid statistical portion of the Earth. Just because the temperature of the Earth rises at (say) 1° C per hundred meters in one area it does not necessarily follow that (a) This is the same across the world or (b) That temperatures continue to increase at all depths beneath the Earth. Scientists are aware of this. However, no one questions for one moment the idea of rising temperature as one goes deeper into the Earth. What’s to say this really is so? No one has discovered a way of determining the temperature deep down. Our best estimates are that lava comes from 20–30 mi down. But what will temperatures be like 100 or 1000 mi down? It’s all guesswork—most of it derived indirectly from Newtonian gravity.

The Russians and Germans have drilled the deepest holes into the Earth so far, with the Russians holding the record for depth. In 1970, Russian scientists began drilling a hole into the Earth on the Kola Peninsula. By the

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mid-1980s the bore hole was more than seven mi deep. From this depth it took 18 hours to hoist samples to the surface. The Earth's crust supposedly has an average thickness of about 21 mi. The Russian engineers had achieved an amazing feat of modern drilling technology.

Before drilling began on the Kola Peninsula, USSR, the scientific expectation was that temperatures would increase at about 1° C per hundred meters. In practice, the rate of increase was 2.5° C below 3 km. At the 10 km level, the temperature was 180° C rather than the expected 100° C.[4] The increase in temperature was not steady. It changed below a depth of 3 km and increased faster than they had expected.

A later report from Germany concerning the Oberpfalz site states that below 500 m the temperature gradient was 28–30° C per km, instead of the anticipated 22° C per km. Further, at the completion of the hole at 4,000 m, the temperature was 100° C. At 3,400 m, at a temperature of 118° C, they encountered water which was rich in potassium and which was twice as salty as the sea.[5]

The Germans thus found that the temperature of the brine at 3,400 m was warmer than the temperature encountered further down at 4,000 m. In this case, the temperature rose rapidly, then later declined, and became cooler. There were also unexpected density profiles. It was generally expected that rock density would increase with depth, as pressures rise. The early results from the Kola Peninsula indicated that densities did indeed increase with depth initially, but at 14,800 ft the drill encountered a sudden decrease in density, presumably due to increased porosity.[6]

The only "reliable" method we have of knowing what goes on in the Earth beneath our feet comes from the science of Seismology. The Earth generates seismic waves during earthquakes. These waves travel along the surface of the Earth and also very deep into the Earth. Some, we are told, travel through the core of the Earth. These seismic waves are our only means of knowing what lies deep beneath our feet. These waves travel thousands of miles through every part of the Earth.

We do not know exactly where these waves go. All we have are stations along the surface of the Earth. These stations measure the wave strength and direction. This data from stations around the world is correlated and analyzed by computer. Scientists apply complex mathematical techniques to this data and from this they try to determine what exactly is taking place down there.

Mathematics and seismic waves alone cannot give us all the answers.

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There is a limit to what can be achieved by these methods alone. Scientists cannot go “blindly” into a study of seismic waves to determine what the structure of the Earth is. Scientists are forced to make some “assumptions” as their logical foundations. They are forced to have a theoretical basis from which to start. Newtonian Gravity supplies us with the mass of the Earth. From this the density of the Earth is inferred. The average density of the Earth, thanks to Cavendish is 5.5 gm/cm^3. The only place where scientists can physically measure the density of the Earth is here on the surface. Scientists have found the density here to be in the vicinity of 2.7 gm/cm^3. Scientists therefore assume that the density of the Earth deep below the surface must be greater than 2.7 gm/cm^3. It is from this that they produce models which show the Inner Earth to have densities of 8 and 10 gm/cm^3. They have come up with “shells” of varying density and characteristics. They then interpret the seismic waves in the light of these models. If the models seem slightly wrong they change the features of these models. All the models however are conceptually the same. They assume (a) An increasing density in the Earth as one goes deeper. (b) Increasing temperature in the Earth with depth.

Scientists then use other knowledge from physics to make other educated guesses of what might be down there. For example, they can estimate the speed of seismic waves through different materials.

The basis of seismology consists of a series of tables which give average travel times for different types of seismic waves. Seismologists can, through the application of geometry, determine the epicenter of an earthquake and they can attempt to determine the depth at which it occurred. A strong earthquake can send seismic waves around the world easily. These waves travel virtually everywhere. But these waves are not uniform. They have varying characteristics. Scientists study these characteristics to deduce what may lie beneath the surface of the Earth.

Varying travel times are thus analyzed. Over a period of time scientists have noticed sharp changes in the speed of seismic waves which occur at certain depths. These speed changes have been interpreted as being due to different materials. Since these speed changes occur more or less in the same places, it has come to be accepted that the Earth’s makeup at different levels differs. The Reader should realize that the science of seismology contains two very broad assumptions which no one has ever been able to verify:

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1. The speed of seismic waves beneath the Earth is ultimately inferred from our understanding of the structure of the Earth based on Newtonian Gravity. We have no way of being certain that these waves really are reaching these depths or travelling at these speeds.
2. We cannot be sure that speed changes are due to the changing constitution of the Earth.

Let me elaborate more upon (1). Since the Earth is thought to be becoming denser with increasing depth, it logically follows that the seismic waves will increase in speed. This is Newtonian gravity talking. What this means is that the speed of seismic waves travelling along the Earth's surface may be measured with a reasonable certainty. All waves which go deeper seem to travel faster. But the real question is how deep do they really go, and what is the density down there? It is in the behavior of seismic waves deep inside the Earth over which there hangs a question mark. We really do not know the path these waves took.

We expect the waves to be refracted. Physics tells us how these waves will be refracted if the density increases. But again, how do we know for certain that the density really is increasing?

With respect to point (2), we again find Newtonian Gravity here. Since we "know" (merely by extrapolating Newtonian Gravity within the Earth), exactly how Newtonian Gravity should behave down there, we "know" that the changes in seismic wave performance can therefore only be due to physical changes in the makeup of the Earth. None of this has been tested, nor is there a way of testing this. So we're sitting with untried theory and merely applying it to conditions deep inside the Earth which we have no direct experimental knowledge of.

The Russians made a discovery which lays much of the underlying theory of seismology open to question:

> Minister of Geology Yevgeny A. Kozlovsky has reported. . . that 'with increasing depth in the Kola hole, **the expected increase in rock densities was not recorded**. **Neither was any increase in the speed of seismic waves nor any other changes in the physical properties of the rocks detected**. **Thus the traditional idea that geophysical data obtained from the surface can be directly correlated with geological materials in the deep crust must be reexamined**.[7]

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There are many seismic reflectors deep in the crust that presumably represent transitions from one type of rock to another. In addition, at about 5 km, all continents are underlain by a strong velocity discontinuity called the Conrad discontinuity. At this juncture, theory has it that acidic, granite-type rocks change to basalt.

Before drilling their super deep hole on the Kola Peninsula, Soviet seismologists discerned not only the Conrad discontinuity (at 9.5 to 8.5 km) but several other reflectors as well. R. Monastersky related what they actually found via drilling: “Yet when the drill actually reached a depth of 9.5 km, the scientists did not find basaltic rock. Even at the present depth of 12 km, the drill has not crossed into the region of layered basaltic rock. The Soviets now believe that if the basaltic layers exist, they must lie much deeper.”[8]

The Soviet seismologists had checked the area and were sure that the Conrad discontinuity existed at that depth, but when the drill passed through it and even deeper, there was no change in the type of rock. This demonstrates how easily theory can fall down in practice. It lays open to question all our supposed “factual knowledge” of what lies hundreds of miles beneath us.

They had conducted extensive studies and also drilled a number of 1–1.5 km deep holes. They had expected to find: “sedimentary” rock down to 4.7 km, and “granitic” rock down to 7 km and “basaltic” rock below that. The “granitic” rock was only found at 6.8 km, and to date, the “basaltic” layer has not been found. A Russian scientist, I. A. Rezanov, suggested that a misidentification of reflected seismic waves by a variety of rock might have caused them to believe there was an apparent layering of rock.[9] Similar thoughts have occurred to others too. The Conrad discontinuity might not represent a fundamental change in chemistry. It might be a metamorphic alteration brought about by heat and pressure. Surface seismological data at the Oberpfalz Forest site indicated a rock boundary at 3 km, but at the termination of drilling at 3.5 km no sign of it had been found.[10]

Our view of the inner Earth might be very skewed. The Kola hole was drilled through hard crystalline rock, whereas most oil or gas drilling is done through sedimentary rock. Since most of our knowledge of the Earth is obtained from those searching for gold, minerals, and oil, one can’t help wondering if this skews our view of what the inner Earth may be like. We only search for these minerals in specific regions and this may be misleading us further. Again, in Germany, the rock changes did not occur as expected.

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Another indication of the elusiveness of underground structures is a magnetic anomaly in France. Running north–south across the Paris Basin is a strong magnetic anomaly that has puzzled scientists for over a century. Electromagnetic surveys on the surface put the magnetic body responsible for the anomaly at a depth of 3 km. However, the Sancerre–Couy bore hole in the Paris Basin terminated at 3.5 km without finding any sign of the rock creating the anomaly. It must lie much deeper than surface instruments indicate.[11]

Each time these scientists do not find the supposed structure they state that perhaps it lies deeper. However, what about their careful analysis of seismic wave travelling times? If these were so accurate there should be no problem. Do these structures really represent something physical to begin with?

There are seismically reflective regions or “bright spots” in the lower crust (below 10–15 km). Seismic profiling and surveys have found reflectors to be quite common in the lower crust. Seismic reflectors present science with at least two problems:

1. What is the physical nature of the reflectors?
2. Why are they confined to the lower crust and, apparently, the upper mantle?

Pertinent to the problem of lower crust reflectors is the observation that some regions in the crust producing strong laminated reflections typical of layered rocks are found, upon being probed by the drill, to be something quite different.

A hole in question was drilled in Arizona in 1980 in the upper crust. A fault zone was found at the location of the layered reflections, but the composition of the rocks did not change enough to account for the strong reflections.[12] These holes seem to prove that much of the predicted structure changes have never turned out to be real. If we find such errors at depths of just a few kilometers how much less can we trust our ideas when dealing with rock which is hundreds and perhaps thousands of miles beneath the surface?

CIRCULATING FLUIDS

Scientists have stated that the high pressures deep in the Earth would

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close rock fractures and reduce porosity to near-zero. No one expected to find circulating fluids at great depths. In *Science*, R. A. Kerr wrote:

> The most surprising discovery in the Kola hole is 'circulating fluids' where none should be. 'Throughout the Kola super deep bore hole,' wrote Yevgeny Kozlovsky, Soviet Minister of Geology, in 1982, 'gases and inflows of strongly mineralized waters have been encountered, circulating through broad deformed zones. This is so even near the present base [11.5km] of the bore-hole. . . ' The gases include 'methane and other hydrocarbons.' The presence of fractures open to fluid circulation at pressures of more than 3,000 bars was unanticipated."[13]

Western scientists tried to blame this on the Russian techniques. They were very skeptical about the presence of circulating fluids that deep. They point out that drillers often pump fluids down the drill to lubricate the bit, and that it would be hard to distinguish between these and naturally occurring fluids.[14]

Scepticism about the deep circulating fluids found by the drill at the Kola site diminished when the drillers at Oberpfalz also discovered hot fluids in open fractures at 3,400 m. This brine was rich in potassium and twice as salty as ocean water. The German scientists were not sure if the fluid was circulating. If it was, its velocity was very low. The brine also contained gases rich in carbon and helium–3.[15]

SHAPE OF THE CORE

The Earth is a flattened sphere. This is due to the rotation of the Earth, and the Earth being somewhat plastic. One would therefore expect the inside of the Earth to be similarly shaped. Yet, there is some evidence that the Inner core may be shaped like a rugby ball. Instead of being flattened, it may be pointed at the top and bottom. The Earth's Inner core, which is thought to be solid, has been slow to yield its secrets to seismic analysis. Modal and travel-time studies are extremely complex and are controversial as well. The claim that the inner core is actually prolate in shape is by no means universally accepted:

> Some geophysicists calculate that the prolate core has a polar radius that is 100 km longer than its equatorial radius, with the axis of symmetry parallel to the Earth's axis of rotation.[16]

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Even less certain than the claims of a prolate core are those for inner-core heterogeneity and, even more remarkably, hexagonal symmetry![17] These conflicting results in recent times, and the disputes surrounding them make one wonder just how reliable seismology is at those depths.

SEISMIC TOMOGRAPHY

Most people envisage the Earth as very uniform deep inside. This is the product of the "shells" of differing density which are used to educate us about what lies inside the Earth. This concept is also quite logical if one is expecting the density of the Earth to increase. The weight of the rock and matter above will create tremendous pressures deep below. These pressures will pack everything extremely tightly. One does not therefore expect the Inner Earth to have a complex and varied makeup.

Yet as the science of seismology progressed and earthquake records accumulated, it became apparent that strong lateral variations (of the order of 5%) existed in the elastic properties of the rocks through which earthquake waves travelled. Even below 700 km, significant lateral inhomogeneities were being detected in the early 1970s.[18]

These early analyses were the beginnings of what is now called "seismic tomography", which is the construction of 3D images of mantle structures from large collections of earthquake data. These images are now common. But what do they mean? Do they reflect changing geological makeup or are they a reflection of changing pressure?

R. Butler has pointed out that density contrasts over large volumes of rock can give rise to focusing effects that may be confused with local structures, unless sufficient data are employed. These "lenses" can be several tens of km^2 in cross section."[19]

A presentation by O. Gudmundson *et al.* of the California Institute of Technology to the American Geophysical Union led to the idea that "mountains" and "valleys" exist at the core-mantle boundary. Using seismic tomography they had discovered that the core boundary rises upwards to form "mountains" which can be as high as 10 km. The core mantle boundary is also pushed downwards to form "valleys" in other places.

The "mountains" are located under the central North Atlantic, Eastern Australia, south central Asia, central America and the Northeast Pacific. "Valleys" have been discovered underneath the East Indies, Mexico, the

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Southwest Pacific and Europe. These valleys can be as deep as 10 km. The geophysicists have accounted for these features by saying that they are the result of long-term circulation in the mantle where the "colder" and denser rock supposedly sinks to create these depressions. Then, in classic convection current fashion, the hotter rocks supposedly rise and draw the core up along with them.[20]

Some scientists have also spoken of "continent sized" objects at the Earth's core. Scientists are therefore "seeing" some strange structures down there in the Earth. Exactly what they are, and how trustworthy these images are remains to be seen. It does make one wonder whether the pressure down there is as great as scientists presume.

EARTH'S MISSING OCEANS

In his classic, *Journey to the Center of the Earth*, Jules Verne told us of enormous subterranean oceans. Anyone seriously proposing such an idea would be laughed to scorn since the temperatures and pressures down there theoretically prevent such a possibility.

Scientists have been puzzled by what they call the Earth's "erratic rotation." Consider this excerpt from the *New Scientist* in 1986:

> [The mountains and valleys at the core-mantle boundary] . . . may explain why the Earth rotates with a puzzling jerkiness. The length of the day has long been known to vary erratically, by as much as 0.2 ms over a decade.

A team of scientists led by Mary Ann Spieth of Caltech's Jet Propulsion Laboratory believed the Earth's irregular rotation could be accounted for by the "sloshing" of the liquid core material against these mountains and valleys at the core-mantle boundary. They did some calculations which showed that such an effect could cause a day to vary by 6 ms over a decade.[21]

However, about a century ago there was a gentleman by the name of Seth Chandler. He was not an accepted member of the scientific community. Everyone was so convinced the Earth was a rigid body that they were caught by surprise when Chandler was able to prove that the Earth wobbled. Chandler gathered together many latitude measurements. When this data was analysed it was found that the latitude of all locations on the face of the Earth vary over a period of 14 months. The amount of wobble is very small. It

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amounts to a mere 0.2 arcsec. In real terms this amounts to only 21 feet. Latitude measurements going back over 200 years reveal the Earth has been wobbling constantly during that period. Kindly note this is not continental drift, but the slight wobbling of the entire planet.

Why should the Earth wobble? Scientists have done calculations based on the model of the Earth as they believe it to be. According to their calculations friction should damp the Chandler wobble out in about 23 years. But, after more than two centuries it's still there.

There has been a lot of scientific debate over this nuisance fact. Since it should be damped out relatively quickly, there have been scientists who have suggested that perhaps the wobble is caused by earthquakes? There are other geophysicists who say there are many drawbacks to such an explanation.

Some scientists, such as Dr. E. E. Free, believed that earthquakes were caused by changes in the speed of the Earth's rotation.[22] There seems to be some kind of correlation between earthquake activity and the Chandler wobble, but no one can decide which is the cause and which is the effect. Calculations by Ben–Menahem and Israel showed that, even under the most favorable assumptions, earthquakes alone could never account for more than 30% of the Chandler Wobble.[23]

Another scientist, Robert Myerson studied the problem. He tried to see which earthquakes, if any, were related to the Chandler wobble. His conclusion:

> The correlation with smaller deep and intermediate earthquakes is better and implies that the relationship is not a simple one of cause and effect. If both some earthquakes and the wobble are excited by a still deeper mechanism what is it? Perturbations, of either mechanical or electrical, in the Earth's fluid conducting core could provide one answer.[24]

A 1973 paper in *Nature* concluded: "The Chandler wobble and earthquakes may have a common excitation source, the release of elastic energy stored in the Earth, and we show that a resonant coupling between seismic activity and polar motion has the right sign and strength to explain the pumping of the Chandler wobble as a consequence of in-phase release of elastic energy."[25]

Does the above paper indeed provide the final solution to the Chandler wobble? What of Robert Myerson's conclusions in 1971 that something deeper might be at work causing not only the wobble but the earthquakes

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too? Or the calculations which showed that the Chandler wobble was greater than could be accounted for by earthquakes alone? This brings us back to Mary Ann Spieth's work in 1986. Her team of scientists believe that a semi-liquid material "sloshing around" under great pressure might be affecting the Earth's rotation. And, the Chandler wobble isn't going away either.

Scientists have obviously not thought in terms of a Hollow Planet, but what if they did? Firstly, the planet might be much lighter than they believe, and hence more susceptible to the movement of vast amounts of liquid. Secondly, we do not have much water here on the surface. Remember the oceans are extremely shallow when compared to the vast depths of our planet. The oceans barely form a film of water on the Earth's surface. What if much larger oceans of water lay hidden deep inside the Earth's crust? Could these oceans inside the Earth be responsible for the rotational problems and the Chandler wobble too? Could such oceans explain some of the more mysterious aspects of deep seismicity?

SLOW EARTHQUAKES

Earthquakes are caused when stresses build up and the rock then gives way catastrophically. An earthquake is an explosive event. It therefore came as a surprise that there are some earthquakes which have unusually long source durations. During the 1960 Chilean earthquake there were many aftershocks. As an example, the aftershocks on 20 June and 1 Nov were normal in their source duration. But the shocks of 25 May and 6 June had extremely long source durations. The 6 June aftershock had a source duration well in excess of 1 hour compared to the short bursts of approximately 5 min which characterized the normal shocks of 20 June and 1 Nov.

The seismologists Prof. Thorne Lay and Terry Wallace write:

> . . .**the mechanism for the slow rupture process is unknown**, but in the extreme it could produce a 'silent' earthquake devoid of short-period body and surface waves.

They go on to mention that G. Beroza and T. Jordan surmise the existence of "silent earthquakes" which are virtually undetectable and that several of these may be occurring each year.[26]

These slow earthquakes suggest to me that the Earth might not be as tightly packed in some areas as we presume. Are there enormous cavities

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inside the Earth, perhaps caused by erosion and other forces deep, deep down? What would happen if these cavities were to be crushed? Could the forces down there be operating a lot more slowly and weakly? Could horizontal or vertical forces be operating slowly as well?

What if “slow” events prevent us from ascertaining the stranger aspects of deep seismology? Even more mysteriously, could “silent” quakes be occurring which our instruments are incapable of measuring? Could events be occurring down there which are not violent enough to be detected and we therefore have an inaccurate impression of what really is happening down there?

DEEP FOCUS QUAKES

Newtonian gravity predicts very high G values inside the Earth, and although all of seismology is based on the natural consequences following on from this, I wonder if this really is so.

The table below was constructed from various tables on pages 218 and 222 of Bullen’s, *An Introduction to the Theory of Seismology*, 1947. The density figures chosen were those of “hypothesis I”. Seismology has always been based on the “obvious fact” that temperature, pressure and density increase with depth. The table illustrates this. It also shows how the value of G rises and falls according to a combination of depth and density, with G finally reaching a value of 0 at the center of the Earth. According to Bullen, the depth of 2,898 km is key. At this depth he expects a sudden increase in density from 5.61 to 9.70. This is derived from a study of seismic waves.

Depth Km.	G $cm/sec^2 \times 10^{12}$	Pressure $dynes/cm^2$	Density gm/cm^3
0	982	0.000	2.50 (approx.)
600	1001	0.213	4.11
1000	995	0.392	4.65
1600	986	0.680	5.00
2000	986	0.880	5.20
2600	1009	1.200	5.51
2898	1037	1.370	5.61/9.70
4000	800	2.400	11.1
6371	0	3.640	12.3

One important fact in the next table is the value of G, or the attraction

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due to gravity at those depths. These calculated values show that G should generally be greater inside the Earth, up to a depth of somewhere round about 4,000 km. This means density and pressure will keep on rising constantly. This means rock gets packed ever tighter. There are no cavities which can remain open under such pressures. Rock will begin to flow under such stress. Under such conditions, how can there possibly be slow earthquakes (i.e. sources of long duration)? Just as mysteriously, how can there be deep-focus quakes?

Among the strongest evidence that the Earth is rigid all the way down to the "outer core" (where a hollow cavity exists?) comes by way of deep-focus earthquakes. Thousands of deep-focus earthquakes making up 22% of all earthquakes, have been recorded. Theoretically earthquakes cannot occur below 70 km, because the temperatures and pressures there are such that rock will flow rather than break catastrophically. The mechanism for ordinary quakes cannot therefore exist below 70 km because the stresses are always relieved. Scientists hope that a suitable explanation for deep-focus quakes will be found without bending the laws of physics and chemistry, but that might not be possible. Professor Lay *et al.*, writes:

> Deep earthquakes have long posed a problem for seismologists. **Laboratory experiments indicate that the pressures at a few hundred kilometers depth should prohibit brittle fracture and frictional sliding processes**. Yet earthquakes as large as (magnitude) 8.2 have occurred at 650 km. **The deep seismicity has many characteristics that are similar to those of shallow earthquakes**. Most important, the deep earthquakes have radiation patterns consistent with double couples, **which implies shear faulting**.[27]

In the above, Prof. Lay mentions a number of anomalous features of deep quakes. He says that many of these deep events appear to be similar to shallow events, and there is definite seismic evidence of shear faulting. This, by his own statements, flies in the face of laboratory experiments which show that this cannot be occurring under the temperatures and pressures at those depths. But what if the temperatures and pressures down there are not the same as predicted by theory?

Now watch how other seismologists say the same thing and then, in an amazing twist of logic at the last moment, they avoid the logical conclusion

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which this leads to. They do not even entertain the theoretical possibility that the Earth below 70 km might be rigid. This is anathema to them, and they do everything in their power to avoid proposing this as a possible solution. And yet, as you will see, this alternative is really so simple, and it fits the facts amazingly well.

It would seem a pretty straight-forward proposition that if deep events have characteristics matching those of shallow events that perhaps the two are produced by the same mechanism. This is of course unacceptable because theory states that it is impossible. So what do they do? Instead of questioning theory, they do their utmost to try to find any other explanation, no matter how weak. They will clutch at any straw rather than entertain the possibility of a rigid Earth. It seems as if no one dares to ask the obvious question: Could theory be wrong? Is the Emperor naked?

Harold Jeffreys of Cambridge University was one of the first scientists to declare that deep focus quakes are impossible. He maintained that below a depth 50 km the heat and pressure causes the rock to change from a brittle to a ductile material. He pointed to laboratory experiments which showed that rock under high pressure will gradually deform rather than fracture suddenly.[28]

Another seismologist, Dr. C. Frohlich also says the same thing:

> Some earthquakes however, **take place where the Earth cannot fracture**. They occur hundreds of miles down in the Earth's mantle, where high pressure is thought to prevent rock from cracking even at pressures high enough to deform it like putty.[29]

Dr. Frohlich comments on Jeffreys' objections which are more than 60 years old: "Jeffreys' objection still holds: conventional earthquakes, in which rock fractures and slips **should not happen in the mantle**." Frohlich explains that even if stresses open up cracks in rock at those depths, the weight of the rock above it would ensure the cracks close again.

Earlier I quoted Goldsmith who stated that rock would flow and all holes would be sealed beneath 30 km. If rock already flows at that depth, how can shear stresses ever occur there? Dr. Frohlich told me in an e-mail that rock will indeed flow slowly, but if it is subjected to a sudden pressure it will still shear catastrophically. Sudden shearing at shallower depths is easier to understand since this might be due to horizontal "tectonic" motions. But

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there is no place for sudden shearing at the greater depths where deep focus quakes occur. At such depths the rock is already tightly compacted and there is no rationale for sudden shearing to begin with. So even if sudden stresses could cause rock to shear, one is still left without any rational justification for that occurring.

This does not stop seismologists from trying to explain it away by invoking special chemical or pressure properties. Dr. Frohlich places the maximum depth at which earthquakes can occur at 70 km. He writes:

> . . .the materials of the Earth's mantle become ductile below about 70 km; that is, they flow under stress rather than crack catastrophically. Since ordinary earthquakes depend upon such catastrophic rock failure, it would seem that temperatures and pressures in the mantle would preclude earthquakes below roughly 70 km.
>
> This expectation is not met in the real world. Since 1964, more than 60,000 quakes have been recorded below 70 km—some as far down as 700 km. In fact, as the figure (see Figure 3.1) indicates, earthquake frequency actually increases between 450 and 600 km.

Dr. Frohlich goes on to say that no earthquakes have been detected below 700 km. He thinks this may be related to the boundary between the upper and lower mantles which lies at a depth of 670 km.

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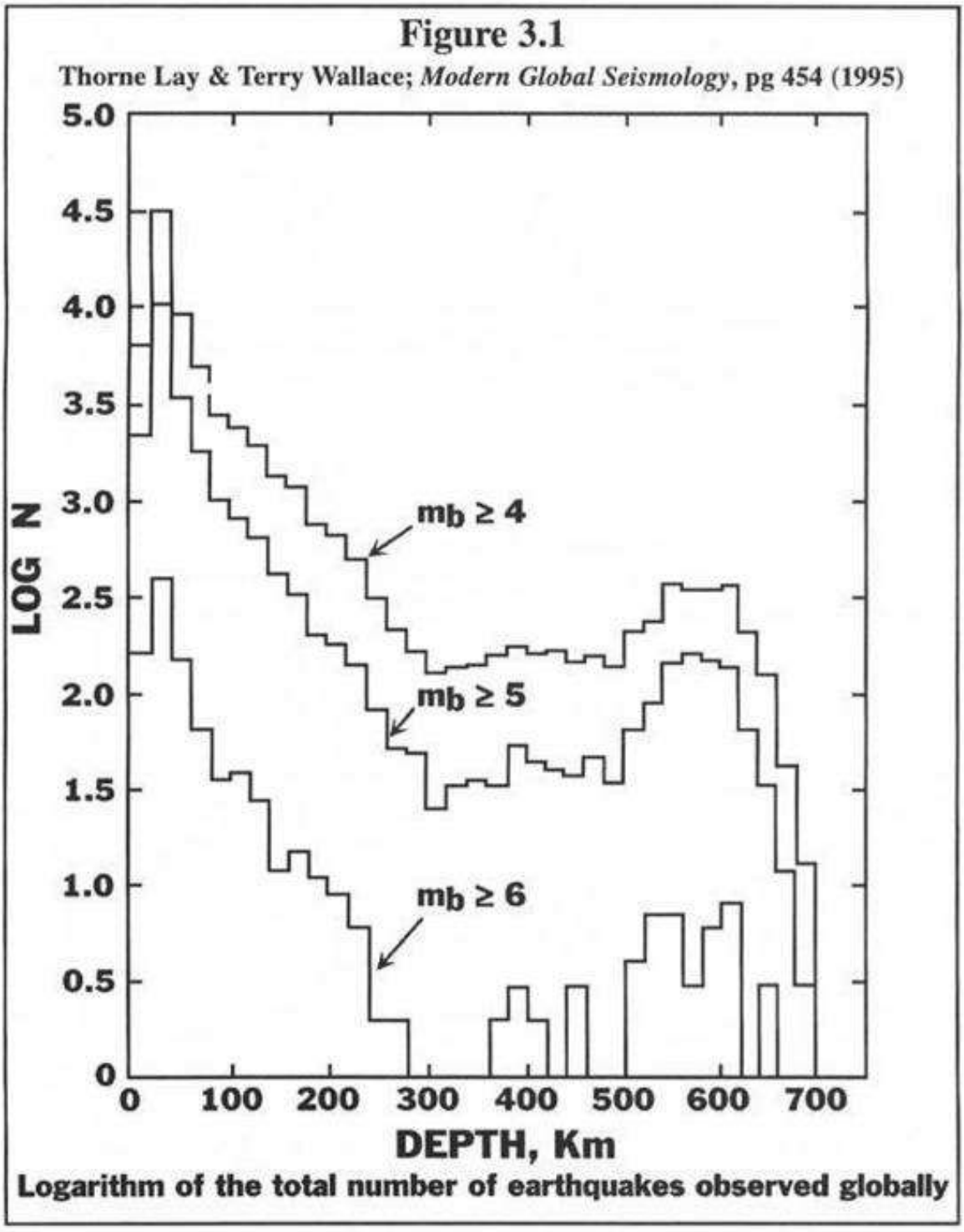

Figure 3.1 shows the number of earthquakes (of various magnitudes) which occur at various depths. Here we can see how less and less quakes occur as we go deeper. From the 350 km mark however, the number of quakes suddenly begins increasing up to a depth of 600 km from whence they

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fall again.

This picture does not match that of increasing temperature and pressure. The number of earthquakes should be falling off with depth and according to Dr. Frohlich, there should be almost none at a depth of 70 km—yet in practice there are quakes down to almost ten times that depth. Clearly something is not right here.

Dr. Frohlich tells us that most deep-focus quakes occur near subduction zones. Subduction zones are areas where "cool" slabs of crust are being thrust into the Earth by surface tectonic forces. These slanting areas are referred to as the Wadati–Benioff zone. Plate tectonic theory states that these "cool" surface slabs of crust are thrust down into the deeper, hotter mantle. "Cool" is a relative term of course, because these slabs are still exceptionally hot. Dr. Frohlich points out that:

> . . . not all deep-focus quakes rumble from subduction zones. Some big ones have shaken Romania and the Hindu Kush, where no subduction zones are presently active. One final point: deep-focus earthquakes are almost never followed by the aftershocks so common after shallow events. In several ways, then, deep-focus earthquakes are fundamentally different from their shallow cousins.[30]

As can be seen from the above subduction alone cannot explain all deep focus quakes. Dr. Frohlich regards certain tremors under Spain and North Africa as being the most mysterious and inexplicable of all because there are no tectonic boundaries, not even ancient ones which can be invoked as an explanation.[31]

Attempts are constantly made to explain deep-focus earthquakes within the bounds of current theory. This is not easy. Take for example the idea that these quakes perhaps only occur inside cool(er) subducted slabs of crust. Frohlich mentions that this argument is not true:

> . . . it is tempting to say that the deep-focus quakes occur within the cool, subducted slabs of crust. This cannot be because, even if the temperature in the slab is hundreds of degrees cooler than the surrounding mantle, brittle fracture cannot occur in the slabs under the conditions prevailing 700 km deep.

See how Dr. Frohlich lurches towards the "cool Earth" answer? But, at the

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last moment he dismisses this because the “conditions” (pressures) “cannot occur” at those depths.

So, sadly, he begins edging away towards other straws, each of which provides only a partial explanation. Frohlich points out a second approach to explaining the deep-focus quakes by appealing to the water of hydration present in some minerals. It is argued that at certain combinations of temperature and pressure, water of hydration is released which lubricates the rock surfaces in subducted slabs. The result is a deep-focus earthquake. We do know that the injection of fluids into surface wells can stimulate small, shallow earthquakes. Deeper down, we would expect the water of hydration to be released at rather sharply defined depths, where the pressures and temperatures are favorable. As Frohlich points out, this suggestion is unworkable since deep-focus quakes do not exhibit this sort of vertical distribution (i.e. they should all be occurring at more or less the same depth). A second problem is that the geographical distribution of deep quakes along the Wadati–Benioff zones is uneven.

Mineral phase changes have also been proposed as quake-generating mechanisms. If a mineral changes to a denser phase very suddenly, conditions for an implosion might exist. Dr. Frohlich dismisses this on the basis of seismic evidence. The seismic signature of implosion events can be easily recognized. He notes that deep quakes are very similar to shallow quakes because the initial motions are:

> . . . downward in some areas and upward in others just as they are in shallow earthquakes . . . it is the same pattern observed in seismograms of shallow events.

He also points out that S waves generated by deep quakes are much stronger than the P waves and this is exactly the same pattern seen in shallow quakes. Like Professor Lay he interprets this as indicating that slip (shear) took place and this could not possibly be an implosion event. Kindly note that earlier, Dr. Frohlich had said deep quakes were different from shallow ones, but as can be seen, the similarities are greater.[32]

Dr. Frohlich had suggested that deep quakes might be occurring in “cool” slabs of rock. But the scientific conception of “cool” under these conditions is very different from the ideas of a layman like myself. As Frohlich points out, the temperatures at those depths are so great that even if

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the rock were hundreds of degrees cooler it would still be too hot for it to produce deep quakes. To truly appreciate this statement and the magnitude of the problem take a look at Figure 3.2 below.

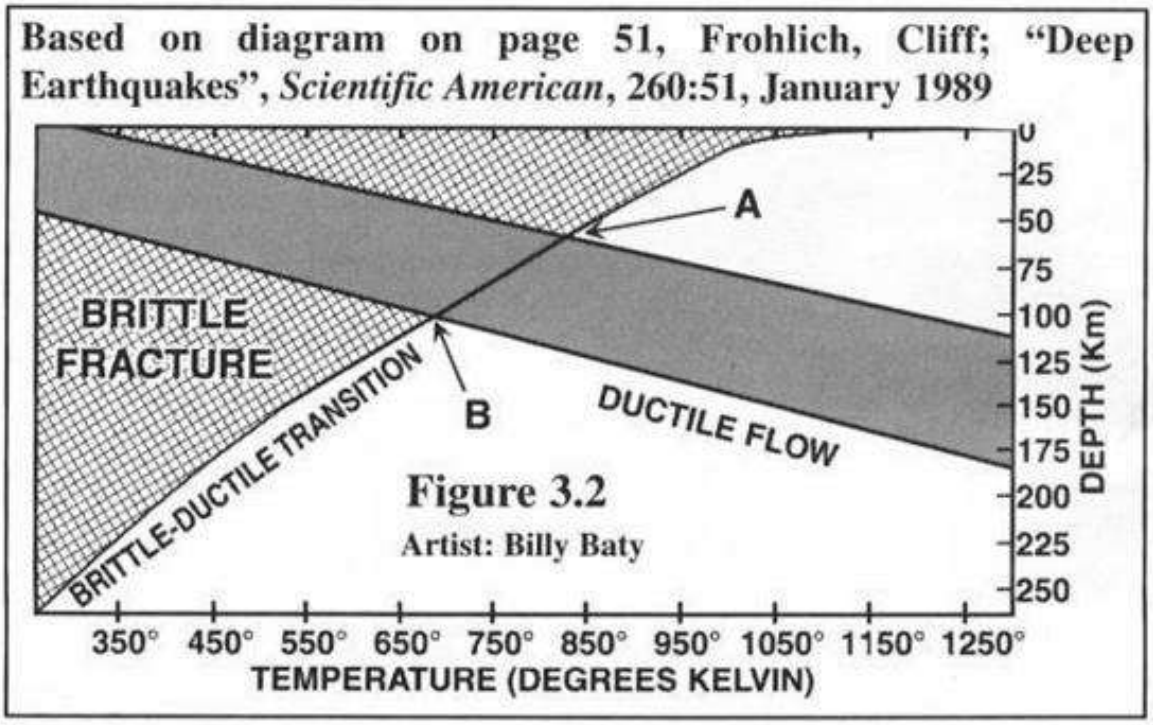

Figure 3.2
Artist: Billy Baty

The diagram has a curve which shows the various combinations of temperature and pressure which will cause rock to flow. As can be seen, greater pressure will cause even cool rock to flow. It is not only heat which will cause rock to flow. Rock at room temperature will flow if the pressure is great enough. This diagram shows conditions down to a depth of 250 km. Keep in mind that deep quakes can occur at 2.5 times that depth. According to Figure 3.2, rock at room temperature will become ductile at depths of 250 km and more. No scientist in his right mind of course expects rock to be at room temperature at those depths. The broad, dark belt stretching across the diagram represents the characteristics of the rock. According to this diagram, some rock will begin flowing at point A, which is a mere 60 km down. All types of rock will flow at point B which corresponds to a depth of between 100–150 km. According to these calculations therefore, all rock will be ductile before the 150 km mark is reached.

Even more impressive are the effects of pressure. Here we can see that rock at room temperature would flow at a depth of 250 km. For rock not to

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flow at the maximum depth at which deep quakes occur it would have to be much colder than the coldest spot in Antarctica! Everyone is expecting heat down there, not rock which is many times colder than ice.

Figure 3.2 clearly demonstrates the impossible nature of the problem. At this point I wish to ask whether these theoretically predicted conditions are correct. Is gravity really operating as we expect? Are these pressures really that great? Note that pressure is a key element here. Rock colder than ice will flow when the pressure is great enough. But is the pressure really that great to begin with? It brings us right back to the gravity problem again.

These seismologists have clearly stated in their writings that these deep quakes are similar in most, but not all, respects to shallow quakes. The real problem here is theory, specifically the theory of gravity. Were it not for the calculations derived from Newtonian gravity, and perhaps incorrectly applied to the deep inner Earth, without the necessary experimental precedent, these seismologists would probably have been open to the suggestion that there is cool rock down there.

These quakes are quite similar to shallow quakes, and in many respects their behavior defies the expectations of greater pressure and compacting. Consider the seismic evidence cited by Dr. Frohlich where he states that sometimes the initial motion of these quakes is upward. Consider too the mention of aftershocks. At first he states that deep quakes have few aftershocks, but the full picture is more complicated. He produces a graph which shows the percentage of aftershocks occurring with depth.

Aftershocks in shallow earthquakes normally occur in a plane which indicates continued slippage produced by stress. Dr. Frohlich tells us that deep quakes generally have one aftershock or only a few at most. Aftershocks from deep events have been found to be randomly distributed in a three-dimensional space around the event. He found that some of the smaller deep focus quakes had aftershocks occurring at distances of 30 km or more from the initial shock. He does not believe that there can be ruptures that long deep in the Earth. He concludes that the aftershocks from deep events must originate from causes which are different to those found for shallow quakes. He does not suggest any possible theories to explain these aftershocks.

In Figure 3.3 we can see how aftershocks fall to a minimum at depths of 150–450 km. Why does the percentage of aftershocks increase below 450 km? Could this be an indication that the deepest of the deep quakes are really occurring near the inner surface of a hollow shell? Note how the curve of

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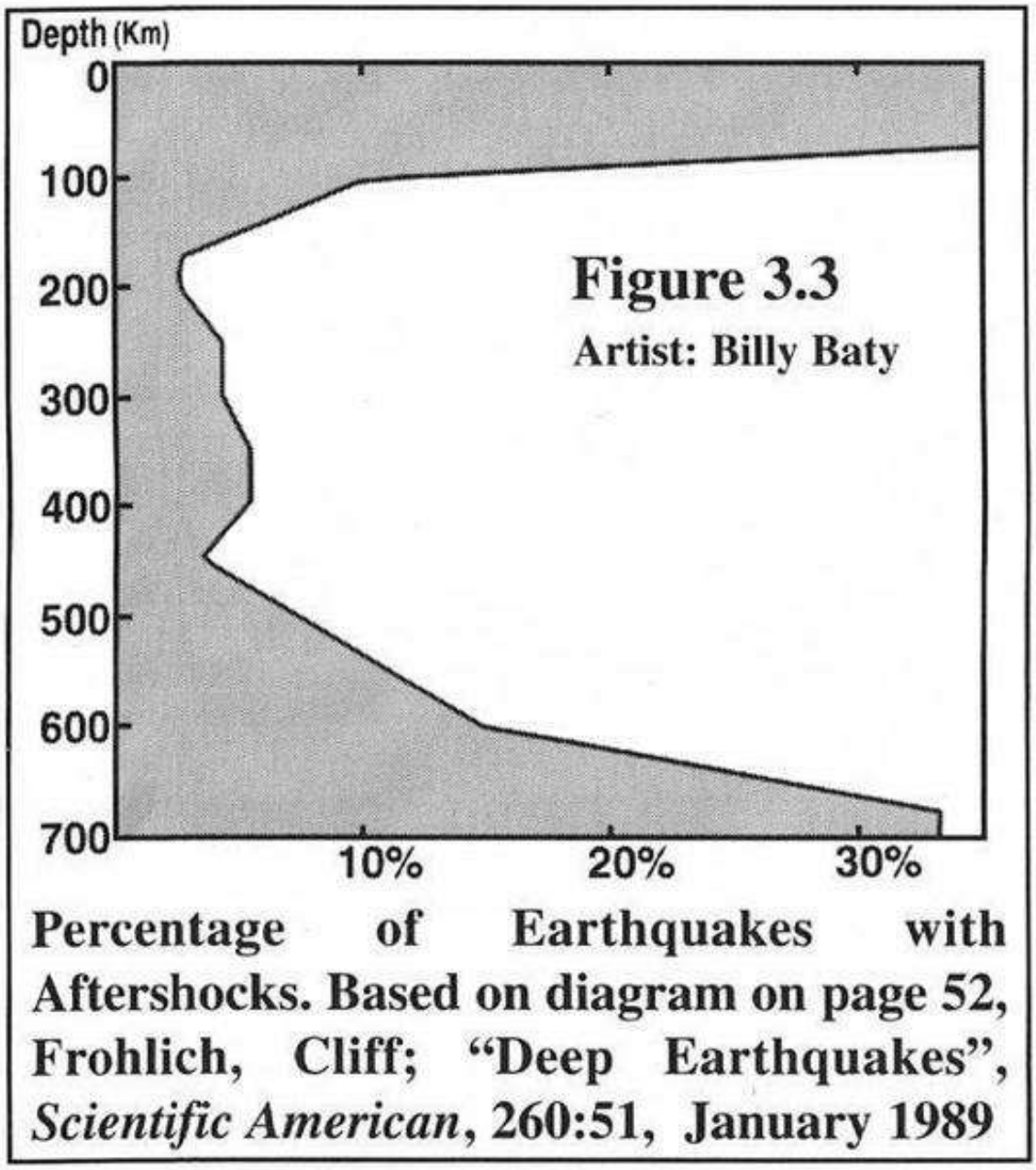
aftershocks at great depths is almost a mirror image of the pattern of aftershocks near the outer surface. Is that not contrary to the expectations of ever increasing density?



As a rule earthquakes of the greatest magnitude occur near the Earth's surface. But, earthquakes of surprising intensity have taken place at enormous depths. What could possibly be causing this? Dr. Frohlich informs

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us that a deep quake with a magnitude of 7.2 took place in Romania in 1977.

An even bigger one of magnitude 7.6 took place in Colombia in 1970. The Colombian quake did not have any aftershocks. Dr. Frohlich and a colleague determined that the deepest recorded earthquakes took place at depths of 680 and 690 km. I contacted Dr. Frohlich to ask him if there were any new developments with regard to deep focus quakes. In April 1998 he replied in part as follows:

> Since 1989 there has been much work in the laboratory on possible mechanisms for deep quakes. A guy named Harry Green has been promoting a very good theory which has promoted a lot of speculation.

He did not tell me what Green's theory entailed. I asked him if he thought Green's theory could indeed be the answer to the deep focus quake problem. He told me that there were scientists who were disputing it because of some large deep-focus earthquakes which were behaving in a manner contrary to Green's theory:

> This and the biggest deep quake in history which occurred in June of 1994 in Peru has caused an enormous amount of speculation; there was a special issue of Geophysical Research Letters on the Peru quake, and I believe Paul Silver wrote a paper in *Science* where he discussed why the Peru quake did not entirely support Green's theory. Green was not impressed. The status now is that there are several possible mechanisms for deep quakes, and Green's is still the leader. But the jury is not in.

The search for deep focus quake mechanisms therefore seems to be far from over. The problem may be more fundamental than scientists have appreciated so far.

Let us now consider deep focus quakes within the Hollow Planets paradigm. The key to understanding it might lie in combining some simple concepts:

1. A rigid hollow shell.
2. The different behavior of gravity deep beneath the Earth's surface.
3. Gravity might be more variable and dynamic than science currently believes. (e.g. electric currents might affect it).

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If gravity varies inside the Earth then we can discard models such as that in Figure 3.2. Pressure and temperature then would not increase as science expects. It therefore follows that the Earth down there would be cooler, and more brittle than theory currently allows for and that shear can indeed occur. It also follows that G will indeed be very different to what is currently expected at various depths. There is no reason why some of the rock might even be in a state of almost weightlessness. Density need not keep on increasing with depth. Nor would there be any reason to expect pressure to close all cavities. At these cooler temperatures we could expect water to flow and to erode deep into the Earth. This water could be one of multiple causes of deep quakes. Dr. Frohlich was quick to say that he could not see how some aftershocks could occur as far as 30 km from the original quake event. He felt that 30 km ruptures were impossible at those depths. And yet, such things would not be impossible within the Hollow Planet scenario. Dr. Frohlich's arguments are based on the idea that all cavities will close due to enormous pressures. But if there are no such pressures then such large ruptures would definitely be feasible.

What about dynamic gravity as a possible source of deep seismicity? What if varying electric currents inside the Earth cause gravity to increase and decrease at various times at various depths? Could this be the cause of the random three-dimensional distribution of aftershocks which has been observed?

Another possibility to consider is that perhaps there are more aftershocks, but perhaps a lower force of gravity and lower density helps to damp it down so that we do not detect it. These aftershocks may be similar in nature to the "slow" and "silent" earthquakes mentioned earlier. It might be that there is more activity down there than our instruments are currently capable of detecting. We might only be recording the most violent events and this may be skewing our views of the inner Earth. There may be much more activity down there than we currently believe.

When all these factors are taken into consideration it seems quite clear to me that the Earth is nowhere nearly as hot and pressurised down there as untested theory predicts. The reality may be much more complicated and we may find ourselves pondering a very alien and exciting Subterranean environment down there. It seems to me as if deep focus quakes may be one of the definitive proofs that this Earth indeed consists of a rigid material.

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HOLLOW PLANET STRUCTURE

Let us compare the solid Earth with the Hollow Earth. The solid Earth, conceptually, is made up of three parts. Imagine three spheres, one within each other. The outer sphere is the Mantle. This region is relatively solid. In it is molten material under great pressure. Within it lies the Outer core. The Outer core is a liquid. Within the Outer core, lies the Inner core which is again solid. The Inner core lies right at the center of the Earth. Scientists also talk of the Upper Mantle and the Lower Mantle, but let us not get too bogged down in the finer detail. In this exercise we are looking at the big picture.

The general structure of a Hollow Planet has only two parts. An outer crust which is relatively solid. And an inner cavity which is hollow and which is probably filled with a gas. Of course it could also contain a liquid if need be. However, the general meaning of Hollow Planet has come to mean that the Inner cavity must contain a gas. If there is a liquid it would probably cling to the Inner parts of such a cavity, like the oceans cling to the outer surface of the planet. Perhaps there are oceans on the inside of various worlds? In my research I came upon evidence which caused me to think that it can be demonstrated that inside the northern hemisphere of Mars there might be oceans whereas inside the southern hemisphere of Mars there are none. So perhaps there are oceans inside planets.

In the early days of my study I was struck conceptually by the similarity between the Mantle of the solid Earth and the Crust of a Hollow Planet. While the Outer core seemed to match the hollow cavity. The one thing which really seemed out of place was the Inner core.

Various people had tried to estimate the thickness of a Hollow Earth’s crust. The number which was accepted most commonly early in the 20th century by Hollow Earthers like Marshall Gardner and William Reed was that the Earth’s crust was approximately 800–1,000 mi thick. How they arrived at these numbers was never apparent to me. One difference with the seismic data was that the Mantle was approximately 1,800 mi thick—compared to the 800–1,000 mi of the Hollow Earthers. Early on, it seemed to me that if the Earth was hollow that a crustal thickness of 1,000 mi seemed amazingly thin and fragile. Especially if one related that to the planet’s diameter of 7,926.5 mi (almost 8,000 mi). One would wonder if such a planet would not be structurally too weak? In my own study I set out to achieve two aims:

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1. Determine if current seismic data could be explained by way of a Hollow Planet model. I didn't just want to throw together any old rubbish for the sake of doing so. I wanted to deduce it properly based on the evidence. I had to be intellectually honest with myself in the process. This is not just a case of drawing circles within circles willy nilly. There must be some thought, some evidence and some rationale.
2. If I could find a model which seemed to have some promise I should attempt to make some broad tentative stab at determining the thickness of this crust. Would it result in similar numbers to those of Marshall Gardner?

Within the Earth's mantle there are several minor features such as the Moho discontinuity and so forth. There is no need to reexamine such features in this high level discussion. These features could easily exist on a Hollow Planet too, and they do not impact the theory in any way. Most of these lesser features are at relatively shallow depths and would lie within the solid crust of the Hollow Earth. The crust of a Hollow Planet would be relatively homogenous—but within it, there could be certain minor variations and features.

Could it be that seismologists are really studying a Hollow Planet without realizing it? This was a question I posed to myself. Can this be possible? How? Let us begin by examining the Mantle. It is here that most seismic waves travel anyway. Figure 3.4 is a diagram showing the path of seismic waves in the Earth's mantle according to our current understanding of seismology. These waves are typically refracted back up to the surface. This refraction is the result of the increasing density of matter inside the Earth. The curvature of these waves is a function of the increasing density of the Earth—in accordance with the mass determined by the Cavendish balance experiment. If the Earth's mass is wrong, and if the evidence from deep focus and slow quakes is correct then those waves will not be refracted as is currently supposed.

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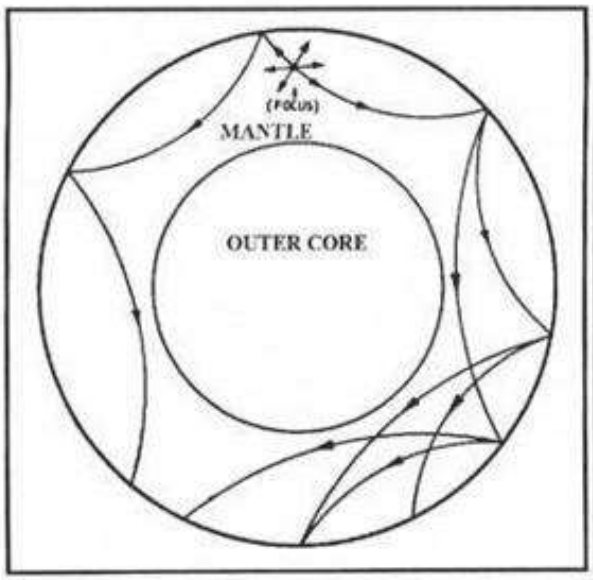

Figure 3.4 Artist: Billy Baty

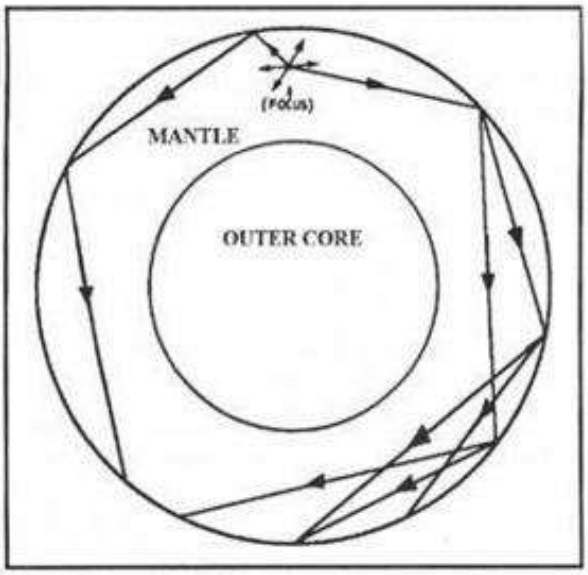

Figure 3.5 Artist: Billy Baty

The Reader might be excused for thinking that Figure 3.4 is the only valid interpretation of earthquake and seismic data. That is only true if Newtonian gravity is correct. The Reader should be aware that this refraction takes place at great depths and over considerable distances. No one has ever been able to test this. Mines are but pin-pricks into the Earth. We do not really know the exact paths of these seismic waves.

What we do know for a fact are the points at which these waves again strike the Earth's surface. We do not know this on a wave-by-wave basis. Instead, we know that there are a greater and lesser concentrations of seismic waves at certain distances from the epicenter of an earthquake.

An earthquake or underground nuclear explosion creates so many waves that it is very difficult to know where the waves came from or went to. This is done gradually by analyzing various features from these seismograms. Extremely complex and laborious mathematical procedures are needed to make sense of seismic waves. It is a science which consists mostly of mathematics with a bit of physics as its theoretical basis. It is this theoretical basis which I am questioning.

In seismology one cannot just take the Earth as a "blank" globe and then deduce the structure of the Earth by way of seismicity—without having a theoretical basis. The problem is that no one knows where the waves go to. Newton and Cavendish gave us a theoretical basis from which to start. No matter what super-computers and mathematical techniques we have—they

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are all solely dependent on the ideas of these two Englishmen who lived so long ago. When scientists use these advanced techniques to look into the Earth they are doing so using glasses tinted by Newton and Cavendish.

If we take Figure 3.4 as a “fact”, representing the points where certain seismic waves strike the outer surface of the Earth, we can redraw it as Figure 3.5. The two diagrams show the waves striking all the same points on the surface. What is different however, are the actual paths of the seismic waves.

The reason I have chosen straight lines to represent these paths is because pressures might not increase with depth. If the deep focus and slow quake evidence is anything to go by, then density might not increase much. If this is so, then the seismic waves will not be refracted much—if at all. There may even be depths at which pressure decreases.

I wondered how a hollow crust would perhaps be constituted? Would it be of uniform density throughout, or would it be sandwich-like and have areas of maximum density on the outer surface and on the inner surface–with a lower density in the middle? Or would it have an area of maximum density in the center? How would gravity affect all this?

It seemed highly unlikely to me, no matter how gravity behaves, to suppose a uniform density throughout a hollow crust. Density would definitely have to vary. The only difference being that the actual variation in density would be of a much lower order than that which science currently supposes. Since such variation would be far less, the refraction of the seismic waves would be considerably less. Seismic waves would therefore travel in almost straight lines.

The idea which seemed to make the most sense (and which later seemed to fit the seismic evidence very well), was the idea that somewhere between the Inner and Outer crusts lay a region of maximum density. Regardless of how gravity behaved, one would always have the transmission of stress by mechanical means by direct contact with rock lying on top of other rock and pressing it down. Thus, gravity on the Inner and Outer surfaces would sandwich the crust together. It seemed as if the density would increase with depth, up to some mid-point between the two surfaces. Whether this area of maximum density would lie exactly at the half-way mark is something I could never decide. I tended to favor the idea that it lay a little beyond the half-way mark (i.e. a little closer towards the Inner cavity). Hence I settled for a diagram along the lines of Figure 3.5. The first two things we can see when comparing this with Figure 3.4 is this:

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1. The paths which the waves are following are much shorter than the curved paths supposed by science.
2. Compare closely the depths to which these waves would penetrate while covering the same distance relative to the surface. Note that in Figure 3.4 the rays just touch upon the Earth's Outer core while in Figure 3.5 the same waves would reach approximately only half as deep. The first results from such an approach thus show that waves would travel more slowly and reach much shallower depths than scientists expect.

Take a look at Figure 3.6. Here we see seismic waves travelling from A to C, and from A to E. That's all we know—here on the surface. We do not know the actual path of the seismic waves. A scientist will however have the travel times for A to C and A to E, but the actual path is unknown to him. He therefore deduces the speed of the seismic wave by assuming the path: A–B–C. But what if the path is virtually a straight line of: A–C? The same is true for A–E. Here, the scientist may determine the travel time of the seismic wave by supposing the path is: A–D–E. Yet, he might be wrong, and the path might be A–E.

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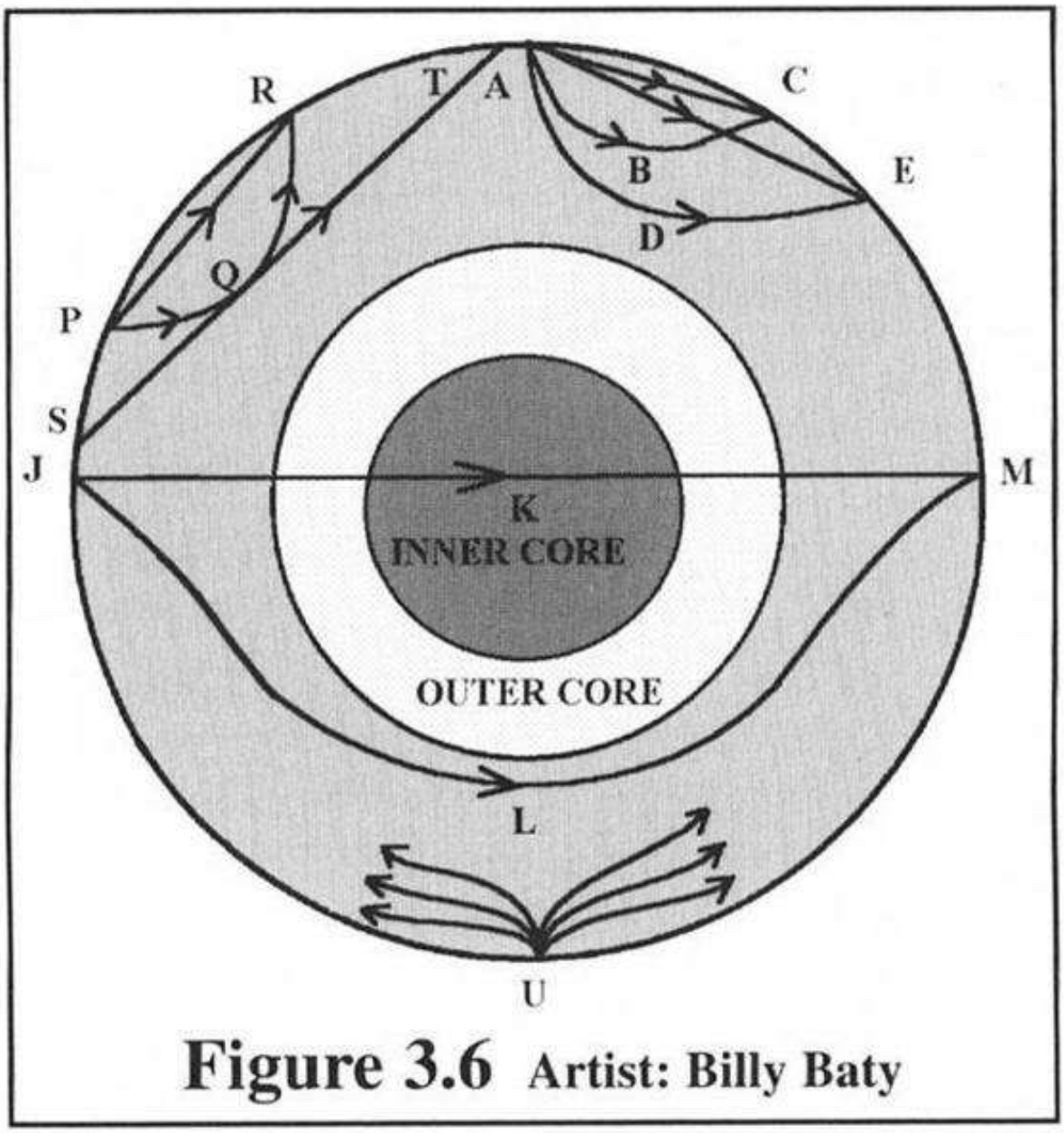

Figure 3.6 Artist: Billy Baty

Let us suppose the scientist determines that a certain series of waves took 80 sec to travel a certain distance. He may determine the length of the path A–D–E as 800 km. He would derive the speed of the waves as: 800/80 = 10 km/sec. But what if the real path is A–E, and that distance is: 640 km? The speed would really be: 640/80 = 8 km/sec.

Since a straight line is the shortest distance between two points, it follows that the more a path deviates from a straight line, the longer the resultant distance is. Keep that in mind as you study the various diagrams in

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this chapter.

The speed of the “surface waves” produced by earthquakes is no doubt accurate because the waves are travelling along the outer surface of the Earth. This is data we can rely on. These speeds are in the order of 8 km/sec. But at depths of about 500 km and deeper, the speed of these waves begin to increase. Yet, no one has any instruments down there which can confirm that these really are the paths travelled by the waves. I know of no experimental way of verifying that these waves are travelling along these paths.

In Figure 3.7 one can see another conventional seismic diagram showing the paths of the seismic waves through the Earth. In this diagram we can see how the different types of waves are labeled. P waves are the Primary waves. S waves are the Secondary (shear) waves. As the waves are reflected off the surface of the Earth, or by the Outer core, the designations are changed from P to PP. Each reflection results in more designations being applied to it. Thus a P wave which is reflected three times becomes a PPP wave.

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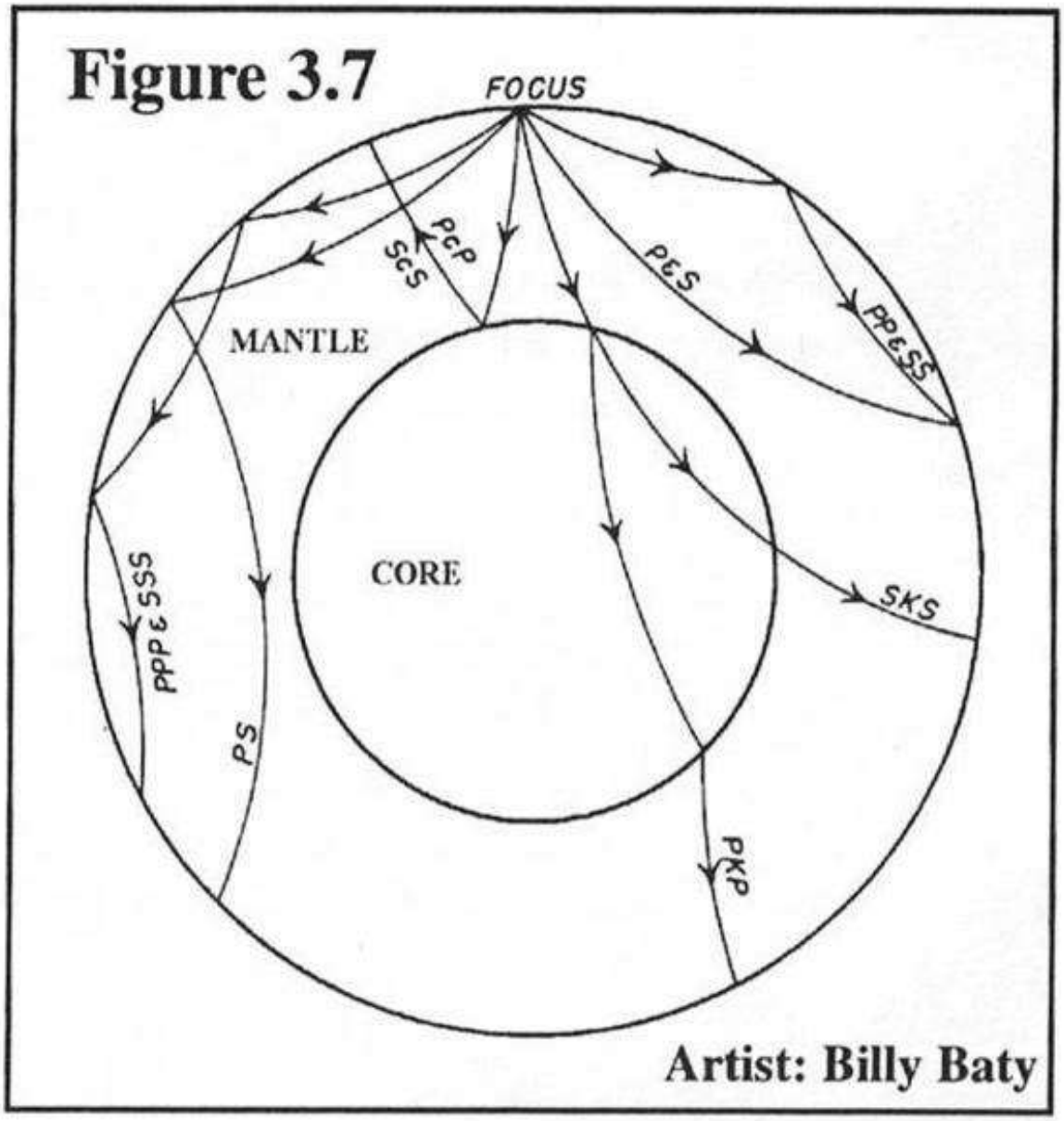

The vast majority of seismic waves travel through the Mantle. Very few penetrate the core. In Figure 3.7 we can see two examples of waves penetrating the Outer core. The one is an S wave which is not refracted when it strikes the Outer core. This wave has the designation: SKS. Another is a P wave which is refracted. The refraction is of course due to the sudden change in density between the Mantle and the Outer core. This is the PKP wave—the K implying that it passed through the core.

For those who may be interested, one can obtain some excellent seismic wave simulation programs. One which I downloaded from Internet was called “Seismic Waves.” It was produced in 1995 by Alan L. Jones of Runtime

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Software. Unfortunately my attempts at contacting him came to naught. So I suspect he has moved and his e-mail address is no longer valid. Nevertheless a search of the World Wide Web may reveal sources for this software, or other seismic simulations. This particular program can run on Microsoft Windows version 3.1. Such software can do what I can't do in the pages of this book. It shows in detail how various waves are reflected and how the waves travel through the Earth.

One of the first things which struck me in these simulations was just how many waves are reflected from the Outer core back up the Mantle. In these simulations one can see entire wave fronts of waves reflected back from the Outer core. There are more waves reflected back from the Outer core than those which actually penetrate the core. Here is part of our first early confirmations that perhaps the Mantle really represents the crust of a Hollow Planet. Whereas a PKP wave actually penetrates through the core, a PcP wave is reflected off the core. One can see this in Figure 3.7. Even in that diagram one can see that most of the waves which seismologists study are merely reflections between the surface of the Earth and the Outer core. Most of the waves do not penetrate the core.

In Figure 3.8 the Reader can see just how many times waves can bounce back and forth between the Outer core of the Earth and the surface of the Earth. This is just the sort of behavior one would expect to happen in the crust of a Hollow Planet. Here the waves would bounce back and forth because there is nowhere else for them to go.

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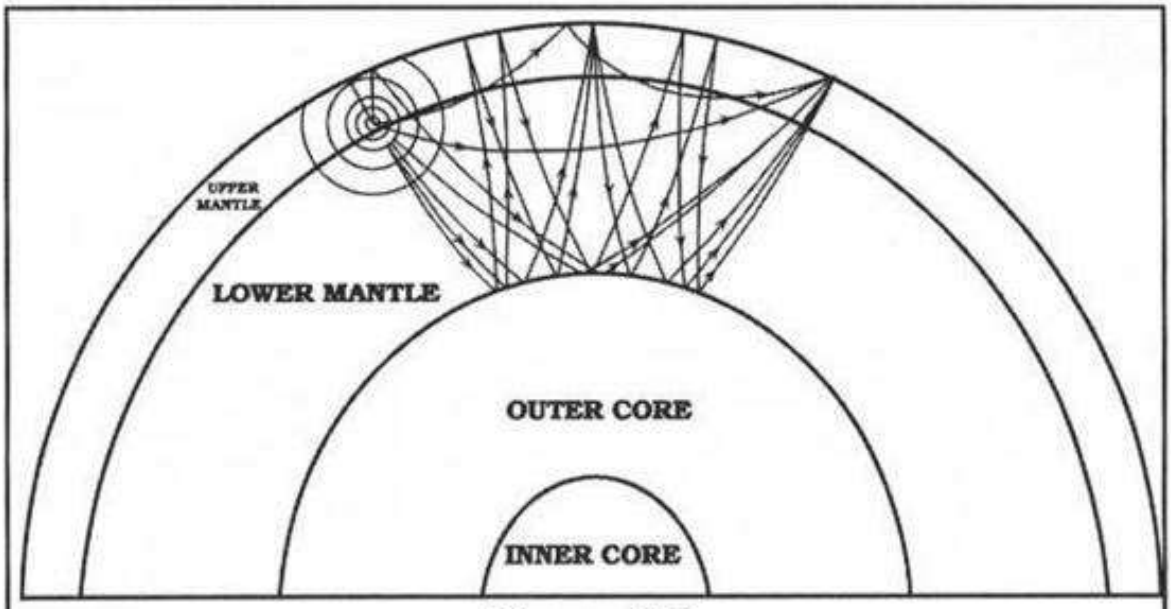

Figure 3.8
Adapted from Wallace & Lay; *Modern Global Seismology*, 1995, Fig 7.7, pg 251

The standard scientific explanation for this behavior is that the Outer core has a different density and this causes it to reflect some waves while others pass through it. The greater majority of waves however are reflected back and only some pass through the Outer core. Even less pass through the Inner core.

The Reader may at this point be wondering how waves could pass through the Outer or Inner Cores, if this is a cavity as I suppose it to be. Now this is an interesting question which also bothered me considerably. The existence of an Inner Core would indeed show that the Earth must be solid.

The existence of the Earth's Outer core is the result of an interesting analysis done by scientists. P waves are compression waves. They are similar to sound waves. They are caused by a forward pressure. Such waves are capable of being transmitted through both solids and liquids. S waves are shear waves. These waves are the result of rock vibrating "from side to side." Such waves can only travel through solids. Such waves can only be transmitted by solid matter which has rigidity.

Scientists found that P waves are the only waves which are capable of penetrating the Outer core. Most scientists are of the opinion that few, if any, S waves actually penetrate the Outer core. They therefore concluded that the

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Outer core must be a liquid.

This is an interesting conclusion. It does not necessarily follow that “not solid” equals “liquid.” If S waves do not pass through the Outer core then it is simply an indication that the Outer core is “not solid” (i.e. not rigid in its makeup). Now “not solid” can mean several things. “Not solid” can mean it is: (a) Liquid (b) Gas or (c) a Vacuum. All these are possibilities. The reason scientists have settled on option (a) is simply because they have this enormous amount of unaccounted mass which Cavendish told us should be there. Hence they deduce that we have an exceptionally dense liquid there. But as I say, if it were not for Cavendish we would have at least three options open to us.

From a practical point of view I would exclude the possibility of a Vacuum. A Vacuum would be self-destructive. Eventually liquids and gases would be sucked into a Vacuum anyway. So a Vacuum could never last for very long (in terms of the age of the Earth). So the only real possibilities are: (a) Liquid or (b) Gas. Now which of the two is it?

In 1864 Lord Kelvin argued that if the Earth was cooling down then the most logical consequence would be that the Earth’s core would cool and solidify first. He strongly disagreed that the crust would cool and solidify first. The solidification process would begin at the center and move outwards. Kelvin did not believe in the view that the Earth was molten and that it had a rigid crust 30–100 mi thick. The Earth, he concluded, must be far more rigid than is supposed. He thought that the Earth was more rigid than a solid globe of glass or perhaps even one of steel.[33] The fact that seismic waves do indeed pass through much of the Earth is itself a vindication of Kelvin’s views that the Earth must be a rigid body.

In Figure 3.9 we can see what happens to waves which traverse the Outer core. We can see in Figure 3.9 (a) that E represents the Outer core. The difference in density between D and E cause a sharp refraction of P waves. This causes some waves to pass sharply into the Outer core. Upon coming out of E, and returning to the Mantle on the other side of the Earth they are again sharply refracted. We see that from approximately 103° to 143° there is a sharp drop (but not complete absence) of P waves. This “shadow zone” has long been known. This “shadow zone” was the first indication of the existence of an Outer core. It was discovered early this century. Beyond the 143° mark there is a greater concentration of P waves. This concentration has been brought about by the sharp refraction of waves which passed through

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the Outer core.

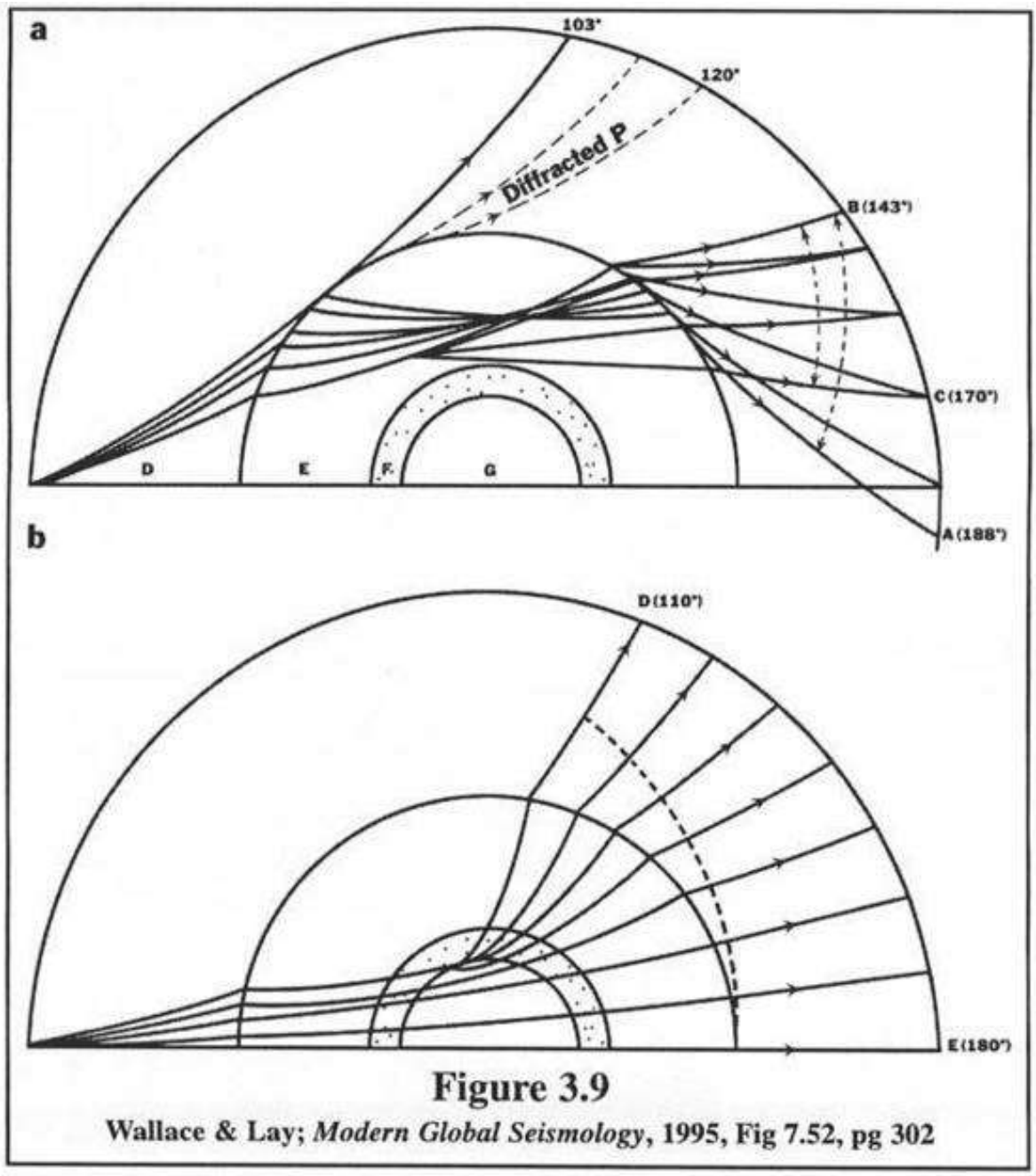

Figure 3.9

Wallace & Lay; *Modern Global Seismology*, 1995, Fig 7.52, pg 302

In Figure 3.9(b), we can see the very few waves which penetrate the Inner core. These few waves are sharply refracted and they spread out between 110° and 180°. This Inner core is again solid. Thus we have a solid Inner core floating in the center of a liquid core. Another reason for supposing it to be solid is because of the increased speed of waves which

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pass through this tiny solid core.

As the Reader should appreciate by now, waves are reaching the other side of the Earth by a variety of routes. It is therefore hard to tell exactly which waves travelled by which route.

Now that the Reader is familiar with current ideas on seismology, let us return to the problem of Hollow Planets. In a nutshell, one can characterize the general behavior of seismic waves as follows:

1. At a distance of between 7,000 mi (103°) to 10,000 mi (143°) from the epicenter of an earthquake, one finds a “shadow zone.” In this shadow zone there are very few P waves.
2. Beyond the 10,000 mile (143°) mark, there is a concentration of P waves and virtually no S waves. What S waves there are, are those which are thought to possibly have passed through the core. But this is open to dispute and most scientists think there are no S waves in this region.

In doing my own analysis and thinking about Hollow Planets, there was only one Hollow Planet model which could give the same results as the current scientific models. This model is shown in Figure 3.10.

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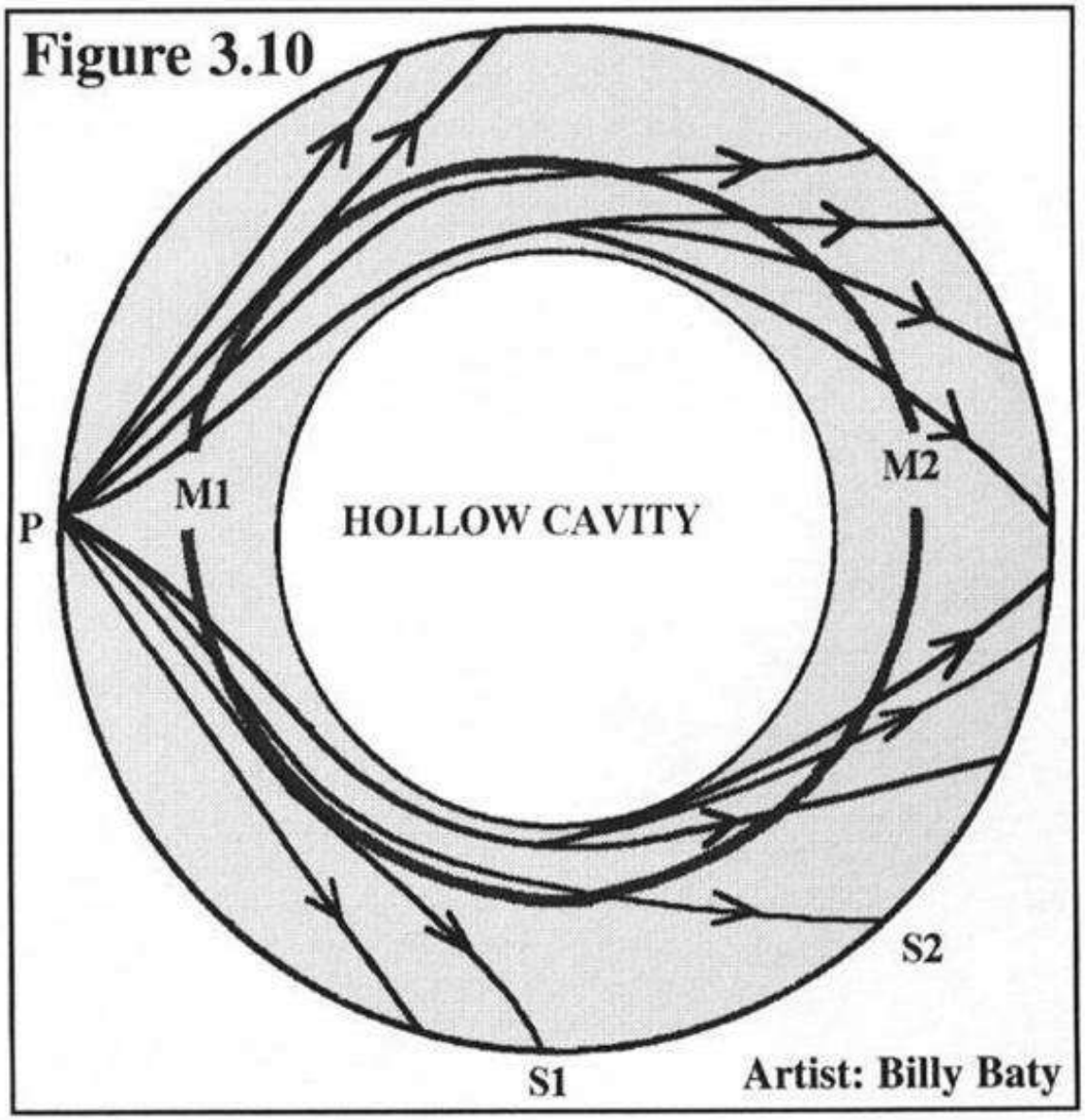

It seemed logical to me that if there was a hollow crust that somewhere in the middle, perhaps more towards the inner side, there would be an area of maximum density. The density of the crust would increase from the outer surface of the Earth to this point of maximum density. From there, the density would decrease toward the inner surface of the Earth. The circle which lies on the points M1 and M2 represents the belt of maximum density. This very simple model exhibits all the characteristics which we have learned from a century of global seismology. The P and S waves which emanate from the epicenter of an earthquake at P descend into the Earth. Those which strike the hollow cavity's surface will be refracted back to the surface of the Earth exactly in accordance with Figure 3.9.

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But what really interests us is the “shadow zone.” The shadow zone is now easily explained. The shadow zone is caused by the belt of maximum density in the Earth’s crust. Herein lies the secret. Suppose we go down into the Earth at point P. As we go deeper, the density gradually increases. It reaches a maximum at point M1. But from M1 downwards, the density decreases again, until we strike the hollow cavity.

Thus, P waves which penetrate beyond the belt of maximum density will find themselves refracted and bent downwards—so that they then travel and curve along the inside of the Hollow Planet. These waves will continue to travel like this until they again manage to penetrate and escape through the belt of maximum density. The shadow zone is thus caused by the change in density in this M–belt which naturally separates the P waves. It also explains why there are some P waves in the shadow region. All that is happening is that the waves are being bent around the Earth and being refocused on the other side in the vicinity of M2. This also shows why there is an increased concentration of waves beyond the 143° mark.

How do scientists currently account for the features of the shadow zone? Figure 3.11 shows their ideas. It is critical to remember that the shadow zone is not entirely devoid of P waves. But how do they get there? Figure 3.11 shows the clumsy path by which waves are thought to arrive in the shadow zone. Figure 3.10 shows in a much simpler manner why there would still be P waves in the shadow zone. It’s not that the shadow zone is entirely devoid of P waves. It’s just that there is a far lesser concentration of them because they are being bent around the Earth to be focused on the opposite side of the Earth. Isn’t the explanation derived from Figure 3.10 simpler and more sensible than the one proposed in Figure 3.11? I wonder what else a detailed mathematical analysis of Figure 3.10 would reveal?

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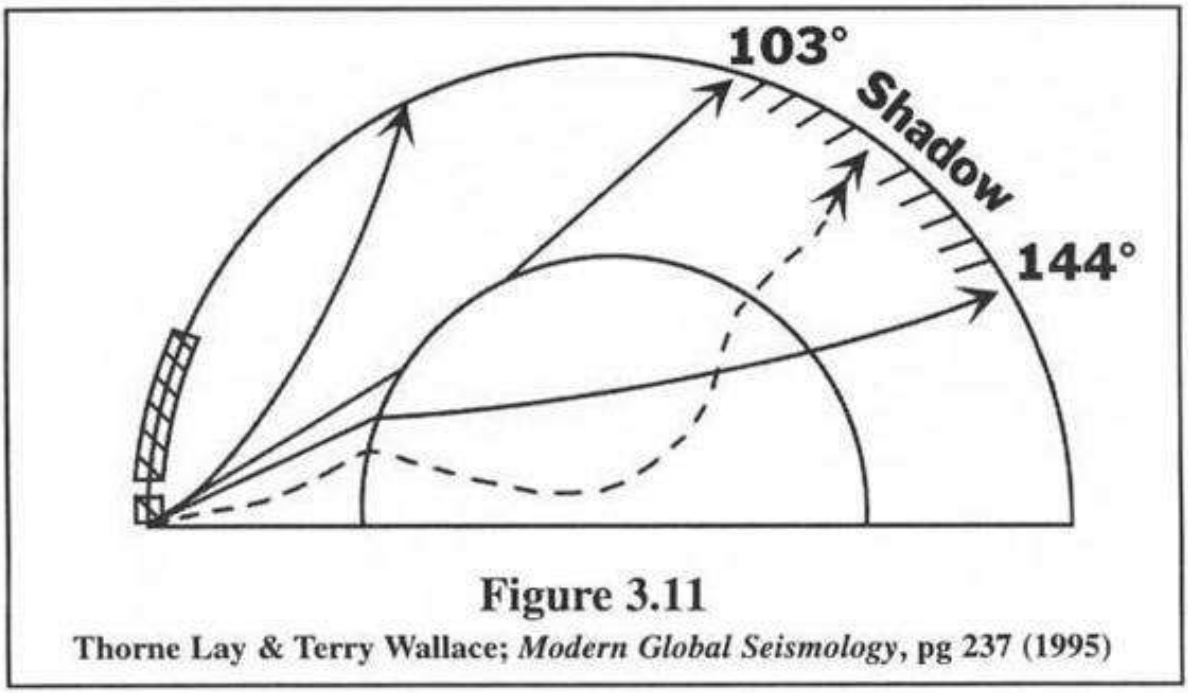

Figure 3.11

Thorne Lay & Terry Wallace; *Modern Global Seismology*, pg 237 (1995)

It can be seen that the waves which are thought to be penetrating both the Outer and Inner cores may be doing nothing of the kind. These waves would simply be those which were caught by the decreasing density and bent around the hollow cavity. Note that since density decreases with depth beyond point M1, that any refraction which takes place is inwards—hugging the contours of the Inner Earth. The rest of the seismic waves bounce between the Inner and Outer surfaces as they make their progress around the Earth.

I was very surprised by the simplicity, logic and the sheer elegance of this simple idea. In many ways, this simple seismic model compliments the simplicity of Leonard Euler's Hollow Earth model. Based on these ideas I have been rash enough to try to determine the possible thickness of the Earth's crust. Since this is a feasibility study, I felt it imperative that I play around with some numbers just to see what the result of these ideas would be.

The only idea which seemed to hold promise was an assumption based on Figure 3.10. Since the "Shadow Zone" lies at 103° from the epicenter of an earthquake, and since the refraction of waves was probably not as great as we think, it seemed possible to make a very rough, tentative attempt at determining the distance from P to M1. I used simple trigonometry, and assumed the line P–S1 to be perfectly straight. I did a calculation with a planetary diameter of 7,926.5 mi and arrived at the figure of 1,496 mi. Thus

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the distance P–M1 would be in the vicinity of 1,500 mi.

Using these numbers I can therefore tentatively set the maximum thickness of the Earth's crust at 3,000 mi (i.e. if we assume M1 to lie at the mid-point between the surface and the cavity.) Exactly what the distance would be between M1 and the cavity is unclear, and I could think of no other approximation I could use. The reason I think the distance from M1 to the cavity is less than from P to M1 is because not many seismic waves actually penetrate the Earth's "core." The "core" would correspond to the area between M1 and the cavity. This distance could be less than 1,500 mi. One could take some thumbsuck guesses and simply say that perhaps the Earth's core is between 2,000–3,000 mi thick and leave it to others with the requisite skills to attempt to make more sense of this model.

I feel that I should at least put some vague numbers to these things. Perhaps it will encourage someone to sit down and analyze this model properly. As I have said from the beginning, this book is serious. It is a serious attempt to analyze an idea which many would think of as ridiculous. But even the ridiculous can be analyzed in a logical fashion. Figure 3.12 is drawn to scale. Figure 3.12 shows the results of this tentative estimate graphically. It shows that if the Earth's crust is 3,000 mi thick, that the minimum size of the cavity would be approximately 1,900 mi—very slightly smaller than the Moon's diameter of 2,160 mi. If the crust is only 2,000 mi thick, then the cavity would be considerably larger. It would have a diameter of 3,900 mi—which would enable the planet Mercury to fit comfortably inside the cavity. It would be almost large enough for the planet Mars to fit inside the Earth. The surface area of minimum cavity (1,900 mi in diameter) is approximately the equivalent size of Russia. These figures are different to those of Marshall Gardner and others.

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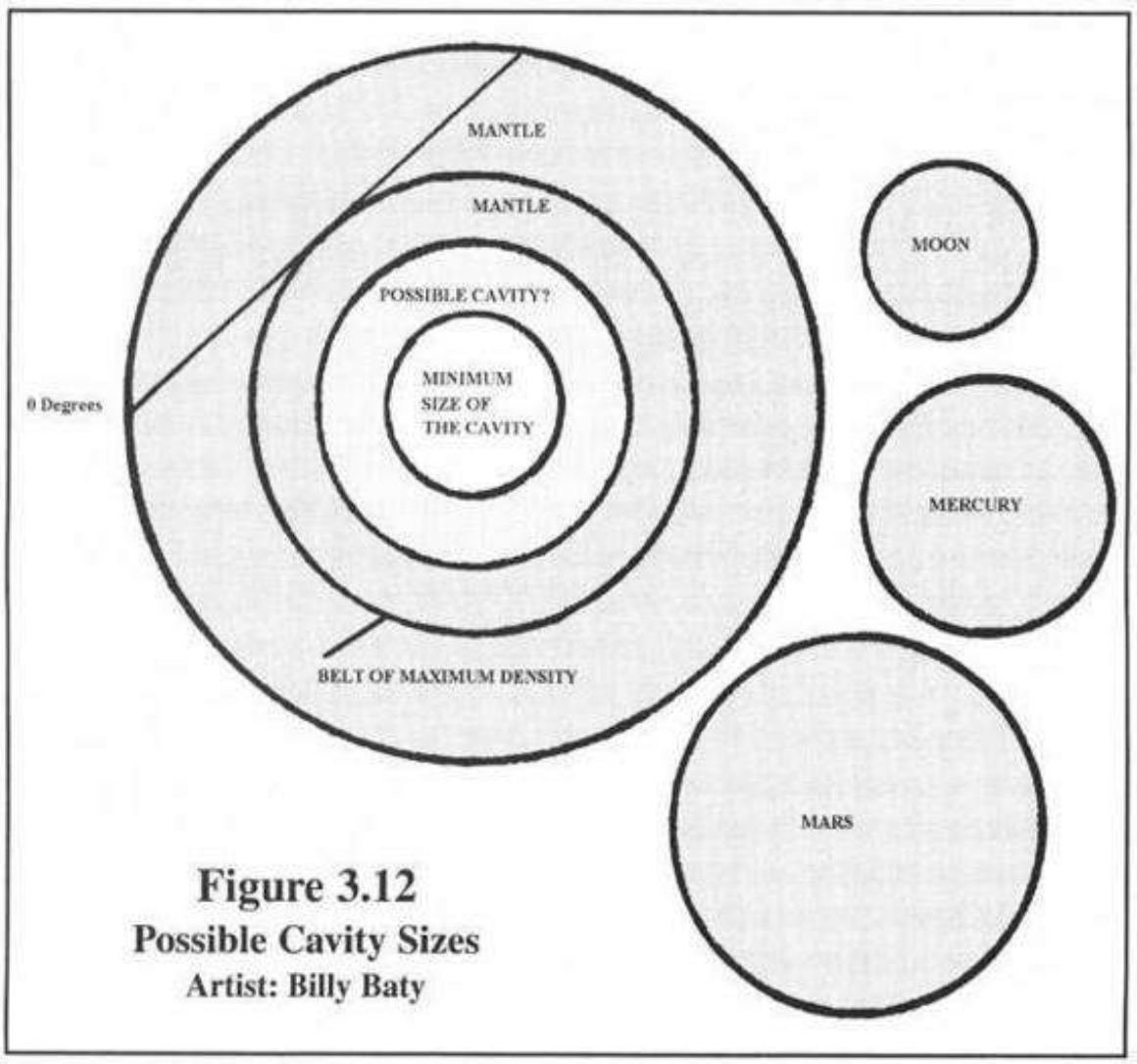

Figure 3.12
Possible Cavity Sizes
Artist: Billy Baty

I studied some of the graphs which show the speed of different types of seismic waves. Many types of seismic waves are open to interpretation. They are assumed to have travelled this route, or to have been reflected, etc. I question the validity of some of the interpretations. However, the P waves, which are the first arrivals, are a much more reliable pointer to go by.

In Figure 3.13, we can see the speed of seismic waves as they penetrate the Earth. The top line shows P wave speeds. We see that P waves travel at approximately 8 km/sec near the surface of the Earth. But as they go deeper their speed increases up to almost 14 km/sec at a depth of 3,000 km. Then there is a very sharp drop in speed for those which go through the core. Those which pass through the Inner (solid) core travel slightly faster. To appreciate the path these waves are taking one should look at Figure 3.9. These times are based on the various refractions of the waves.

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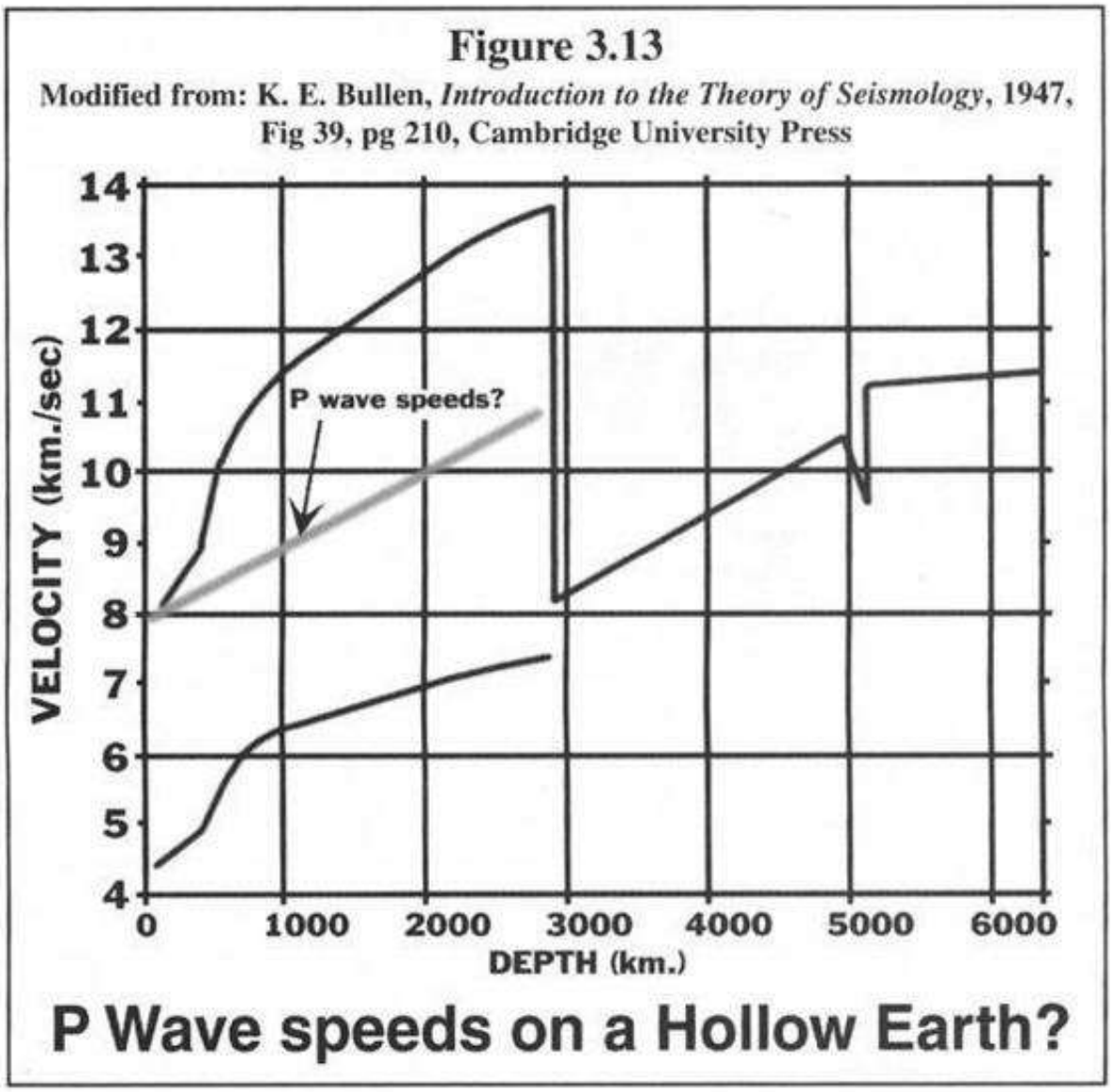
Figure 3.13

Modified from: K. E. Bullen, *Introduction to the Theory of Seismology*, 1947, Fig 39, pg 210, Cambridge University Press



What would a P wave speed graph look like if plotted for a Hollow Earth model? I modified Bullen's original figure to produce Figure 3.13 and plotted a straight line of approximately what I would expect the results to be. The line in Figure 3.13 is nothing more than educated guesswork on my part to demonstrate roughly what I expect—based on the many issues and problems which have been highlighted in this chapter.

From my calculations, and study of the data it seemed as though a nice smooth curve could be plotted for P wave data for depths up to about 1,500 km. It also seems as if the P waves accelerate very rapidly at shallow depths —perhaps even more rapidly than is shown on current seismic diagrams. I

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feel that this deeper mathematical analysis be left to someone who has the requisite skills.

On 13 Nov 1997, a press release was issued by Ken Creager of the University of Washington. He had discovered that some seismic waves slowed down considerably in a short stretch of 300 mi. This was part of a study of his into the apparently “rotating” core. His discovery that seismic waves could slow down considerably over a short distance would seem to be indirect support for my idea that seismic wave behavior is affected by local conditions. If gravity varies inside the Earth one may then find seismic wave speeds being affected inside the Earth.

To understand it, take a look at Figure 3.6. Suppose we have the travel time for a seismic wave which went along the line P–R. Scientists would assume it went by the route P–Q–R. In plotting the speed of the P waves, they would plot it for depths up to Q. However, if the wave really went along the line P–R, it would never have reached that depth. If one were to plot the speed of the P waves along this straight line you might find that P waves appear to be travelling faster at shallower depths in a Hollow Planet model. To find the P wave speeds at the depth Q, one might need to plot the travel times of waves which travelled along the line S–Q–T.

I would like to mention a possibility which I considered but cannot prove. If it were to turn out that P wave speeds in a Hollow Planet model accelerate very sharply at lower depths then I wonder if these waves would also not be highly refracted? This is illustrated in Figure 3.6 at point U. If this turns out to be true, then it makes the resultant Hollow Planet model much more complex. For example, it might mean that the Earth’s crust is even thinner than my simplistic model supposes.

Once one is freed from Newtonian gravity, and one merely studies the seismic waves alone—not sure what path they are taking—the study of the Inner Earth becomes extremely complex and filled with all manner of unknowns. The chance now arises that one may make new discoveries never before considered. This one hint which might suggest that P waves accelerate (and refract?) sharply at shallow depths might be extremely crucial. I wonder what would happen if a handful of scientists were to study seismic waves — while totally ignoring Newton and Cavendish? If scientists were to study these waves alone, freed from current shackles—what valid conclusions could they draw? Perhaps we would all be in for a few surprises?

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THROUGH THE CORE

I wish to address the problem of wave speed through the Earth's core. The speed of pressure waves passing through a medium is dependent upon a number of factors. Two of these are: density and elasticity. These two factors are extremely important. As a rule of thumb, as density increases so too does wave speed. Thus in all the models we can see that wave speeds increase with depth. This is understandable. Among the stranger aspects of solid Earth theory which scientists have had to account for is why there is a liquid core and within it another solid core.

According to current models of the Earth, the Earth's density keeps on increasing right to the core of the Earth. The liquid core is more dense than the Mantle, and the solid core is even more dense than the liquid core. Yet, the wave speeds in the Core are considerably lower than in the Mantle. As the P waves strike the Outer core their speed slows very sharply. The P wave speed at the core boundary is virtually the same as here on the surface of the Earth. In an instant, the waves slow down from almost 14 km/sec to about 8 km/sec. An even stranger situation is encountered when they pass through the solid core. This is the densest part of the entire Earth. Yet here, the waves hardly accelerate at all. They attain a speed of a mere 11km/sec. Scientists get around this by saying that the elasticity inside the Earth varies and therefore the waves travel more slowly than they should. That's a very convenient assumption.

Take a look at Figure 3.6 and compare the paths of waves passing through the solid core along the line J–K–M with the curve J–L–M. What if seismologists think a wave is passing through the core when in fact it is travelling around a hollow cavity? If such is the case then those waves are actually travelling much further than scientists suppose. To travel such a long distance would take quite a considerable time—in seismic terms. That would explain why these waves seem to travel so very slowly through the Outer and Inner cores despite the incredible pressure there. Remember too, that density may be decreasing and those waves might be slowing down—which further increases their travel time around the cavity.

We can see this very sudden drop in seismic wave speeds at a depth of 3,000 km (1,800 mi). Scientists try to explain this by a sudden change in the composition of the Earth. But it could just as easily be that waves which reach this depth are suddenly taken on a detour around a hollow cavity. The

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waves may be physically travelling very fast, but the extra distance will make it appear as though they are travelling more slowly.

Could we use this to say that the Earth's crust is only 1,800 mi thick? I don't know how much we can trust this figure (because of the refraction of seismic waves), but it is worth pondering. If this is so, then the cavity would be quite a bit larger than my model supposes. The cavity would have a diameter of 4,300 mi which is approximately the same size as Mars. We could have an entire world, inside the Earth!

TOMOGRAPHY REVISITED

Seismic tomography produces beautiful images of the Inner Earth. It does appear as though the images are very dependent upon the computer algorithms used by the scientists. Even small changes in these algorithms seem to produce different results. I wonder what would happen if the model in Figure 3.10 were used as the basis for some new images?

CONCLUSION

I am no mathematician. What I have done here is use some basic logic, and to put some numbers to some concepts to see how they pan out. I wanted to see if any of this would make sense. I found that the concept I have presented is internally consistent. For example I inferred a Hollow Planet. I based it on some ideas. And the ideas then resulted in logical predictions which seemed to make a lot of sense—like the shadow zones, and the slow speed of waves travelling through the Earth's core. I would very much appreciate it if someone with the necessary skills could take this model and analyze it further using advanced techniques to see what comes out of it. No one who ever proposed the Hollow Earth ever had the benefit of today's seismic techniques. The analysis and ideas contained in this chapter are probably the only ones of their kind ever done. For an idea which is 300 years old and which has never been taken seriously I find the results very promising. The sheer elegance of the solution amazed me.

Let me remind the Reader of one rather disturbing fact. According to Newtonian gravity the Earth also happens to be the densest planet in the solar system. Why should this be so? Is there any special reason why this planet, of all the planets in the solar system should also be the densest? Mercury is the second densest planet. If it should turn out that the two densest planets in the

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solar system are hollow it then follows that all the other planets in the solar system are also hollow.

Have scientists already discovered the hollow cavity inside the Earth—in the form of the Outer liquid core? I think so. The fact that S waves don't pass through it, and that the P wave speeds are abnormally slow makes me think that this "liquid" core is really the cavity which scientists deny the existence of.

After going through this exercise I find myself wondering even more if perhaps seismologists are studying a Hollow Planet without ever having realized it was so. What do you think?

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Part II: The Inner Planets

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Chapter 4: The Cold Winds of Mercury

Mercury is the closest planet to the Sun. We know less about this world than any other planet except Pluto. It is an extremely hot and virtually airless world. It rotates very slowly which gives the Sun a long time to warm up various parts of Mercury while other parts become extremely cold. Mercury is similar to our Moon in many ways and is only slightly larger than it. Its surface is covered in craters mostly of volcanic origin. Its mass is so low that it is thought to be theoretically impossible for this planet to retain a permanent atmosphere of any substance.

Mercury's atmosphere is virtually nonexistent. There are no clouds on Mercury. There are no dust storms either. There are no cold winds on Mercury. You be the judge. . .

MAGNETIC FIELD MYSTERIES

What causes the magnetic field of a planet? Conventional scientific theory has settled on the Dynamo theory. The Dynamo theory is regarded as a relatively adequate explanation for the Earth's magnetic field. As happens in science, once a theory is developed which applies to the Earth, scientists logically try and apply it elsewhere. As the Reader will see, some of these theories do not work quite as well when applied to other planets.

When the Earth's magnetic field is analyzed it is found to be similar to the field generated by a bar magnet. This field has a magnetic North and South Pole which intersects the planet's surface. These points are the North and South Geomagnetic Poles.

Let it be said at the outset that no one really knows what causes the magnetic field. The Dynamo is accepted by scientists across the board. One of the reasons for this widely held acceptance is simply that there are so few workable alternatives.

The idea of the Earth's molten core was further strengthened by the results of Newton's gravity, when attempts were made to estimate the Earth's mass by way of the Cavendish balance experiments.

Long after Halley we still find that the magnetic fields of the Earth and

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other planets retain their mystery. In this age of computers and satellites, we still do not know how the magnetic field of the Earth or any other planet is generated.

Let me sketch a basic outline of the Dynamo theory for the Reader. The Dynamo theory has its origins in the molten core idea. One thing we do know about the Earth's magnetic field is that it originates at the center of the Earth. But we do not know what it is that lies at the center and generates this magnetic field. Conventional science explains the magnetic field by invoking this molten core idea. It is said that convection currents in the molten core generate the magnetic field. It follows that since the Earth rotates, the molten core also rotates. If the core is generating the magnetic field then the magnetic field's north and south magnetic poles should coincide with the Earth's north and south geographic poles. This also holds true for any other planet.

If this explanation is true then a planet can only have a magnetic field when the following conditions are satisfied:

1. The planet must be hot enough to have a molten core.
2. It must rotate fast enough to generate a magnetic field.

The other problems associated with the Dynamo theory will be examined in greater detail later.

The Reader might wonder why a planet can't be permanently magnetized like the proverbial bar magnet for example. The problem is that any magnet will lose its magnetism if it becomes heated. The point at which it loses its magnetism is called the Curie point. The temperatures beneath the Earth, and at the core of most planets, make this suggestion totally unworkable. This is one of the reasons why scientists have had to find another mechanism.

In my attempt at assessing the feasibility of these old Hollow Earth theories I studied all the aspects of science which I thought might have a bearing on the Hollow Earth theory. One of these is the issue of planetary magnetism. I discovered that some scientists have mentioned these problems. Even so, the Dynamo theory is in some ways a matter of intellectual necessity because our science currently has no other workable alternatives to turn to.

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Could the Dynamo consist of convection currents in a molten core? Or could the Dynamo perhaps be the "Inner Sun" which Euler and Leslie theorized might exist at the center of the Earth? In this regard, it is interesting to note that while Leslie was obsessed with binary stars, and he theorized that two small Inner Suns might exist, it is Euler whose own thoughts were that these Suns were too unstable. Of these two options, it would seem that Euler's is the one which most closely matches what we know about the "Dynamo". The evidence suggests that there is but one "Dynamo" inside the Earth and other planets.

Let us suppose that some kind of "Inner Sun" were to create a magnetic field inside the Earth or any other planet. It would seem reasonable to suppose that such an entity, floating about in the center of the planet could have its poles pointing in any direction. Such an entity would not in any way be linked to the rotation of the planet. As will be seen, there are very few planets in this solar system where the direction of the magnetic field coincides with the geographical poles of that planet.

Scientists get their fair share of unexpected surprises. It was so in the case of Mercury when it turned out to have a magnetic field, in spite of its slow rotation, and in spite of it possibly not having a molten core. The initial analysis of the data obtained on 29 Mar 1974 was that:

> The complete body of data favors the preliminary conclusion that Mercury has an intrinsic magnetic field. **If this is correct**, **it represents a major scientific discovery in planetary magnetism and will have considerable impact on studies of the origin of the solar system**.[1]

The Earth's magnetic field is tilted 11° away from its axis of rotation. Many other planetary magnetic fields are tilted anomalously. Jupiter's magnetic field is tilted by 10° and Saturn's by 1°. Uranus's magnetic field is tilted by 60° and Neptune's by 47°. Some scientists admit there are problems with the dynamo theory:

> At present. . . scientists have only one surviving theory for the origin of planetary magnetic fields. . . the dynamo theory. . . Akasofu notes, however, that **since a planet's rotation is such an important source of energy for its dynamo**, **the observed large tilts of planetary magnetic fields with respect to their rotation axes pose 'a great puzzle**.'

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Akasofu suggests that either the Dynamo theory is wrong, or perhaps, there is more than one magnetic field overlaying each other. Akasofu and his colleagues suggested that perhaps the latter is the answer. Perhaps there is a single "dynamo-created" magnetic field which does indeed match up with the rotation axis of the Earth, but there may be other more distant dipolar fields which overlay it causing it to be skewed. Akasofu and his colleagues noticed this occurring on the Sun.[2]

It is fascinating to see these scientists comparing the behavior of the planetary magnetic fields with that of the Sun. What if each planet simply has a small star inside it to begin with? Would that not solve the problem?

Recently, Ken Crosswell raised several issues regarding Mercury. First of all it has far more iron in it than is allowed by solar-system theory. Plus it has a dynamo that should not exist. Although the intrinsic magnetic field is only 1% that of the Earth's it is still a mystery as to why it exists at all. Croswell writes:

> . . .but where does it [the intrinsic magnetic field] originate? All of the other planets with magnetic fields (Earth, Jupiter, Saturn, Neptune, and Uranus) rotate rapidly and are believed to have molten interiors, allowing fluid dynamos to form. Mercury, in contrast, spins very slowly and seems solid throughout. Therefore, the magnetic dynamos that supposedly create the fields of other planets cannot exist inside Mercury.[3]

Crosswell feels that Mercury can't possibly have a magnetic field because it does not spin fast enough and it is too solid to have a fluid core. Yet in spite of all these theoretical objections, Mercury does have a magnetic field. Mercury exhibits other anomalous behavior too.

William Metz commented:

> Because Mercury rotates slowly (once in 58.6 days) and emits no radio emissions that can be detected from the Earth the **early evidence for a magnetic field was surprising**. . .[4]

Metz was surprised that the magnetic field was off-center by a staggering 47% of the radius of the planet, while being inclined at 10° to the planet's poles. The off-center nature of the magnetic field again raises questions about it being generated by a dynamo at the center of the planet.

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The dynamo is supposed to be at the center of a fluid core. The rotation of the planet is supposed to generate the resulting magnetic field. The above would seem to suggest that the "fluid core" lies a considerable distance away from the center of the planet.

Norman Ness expressed the view that: "There is no question that the observed magnetic field is **intrinsic to the planet**, **but its origin is uncertain**." He went on to speculate about the possible causes of this intrinsic field. He suggested that it might be remnant magnetism which remained after Mercury had cooled down or that there was some form of external or internal dynamo. He even wondered if it might be an internal dynamo like the one which is supposed to exist inside the Earth or Jupiter. He felt that there was no method by which one could tell one type of dynamo from the other by purely looking at the magnetic field data. So exactly which of these types is in operation in Mercury remains a mystery.[5]

Ness's paper illustrates the uncertainty which surrounds the existence of Mercury's "dynamo". Is Mercury's magnetic field generated by an Inner Sun which orbits approximately 700 mi away from the planet's center? If an Inner Sun were to be a reality, we would not know exactly how it is held in place in the center of a planet. It might even move, or sway, as the planet speeds up and slows down. On the other hand, perhaps one cannot be exactly certain of its position since Mercury possesses excess iron and perhaps this distorts the resultant magnetic field? There would have to be some kind of repulsive force which prevents such a Central Sun from crashing into the side of a Hollow Planet. Perhaps the magnetic field which such an Inner Sun generates is itself part of the mechanism which helps to hold it in its place? These are a few possibilities which spring to mind.

Although the Mercurian magnetic field was discovered in 1974, the idea of a fluid core was still not seen as a viable possibility by some in the 1990s:

> . . . **the core itself is very likely solid**. **If it is solid**, **it cannot establish convection cells and thus generate a magnetic field through dynamo action**. In 1975, the Mariner 10
> radioed back that Mercury actually did possess a magnetic field and a surprisingly large one at that.[6]

As I explained earlier, some scientists have even suggested that Mercury is a permanent magnet to account for the existence of its unexpected magnetic

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field. But that idea has problems too. When you heat a permanent magnet beyond its Curie point it will lose its magnetism. Considering the tremendous temperatures on Mercury, this idea seems improbable.

Another problem with the permanent magnet theory is that the Mercurian magnetic field is quite dynamic as will be seen later when I deal with the subject of auroras. In this regard, Mercury's behavior is surprisingly Earth-like.

BLUNT CUSPS

The tips, or 'horns' of a crescent are also known as the 'cusps'. Both Mercury and Venus suffer from the "blunted cusp" phenomenon. When you look up at the Moon during the first quarter, or at half Moon, you will note that the crescent or half-moon shape ends in two sharp points. These two points are in the vicinity of the Moon's North and South Poles. This is the result of seeing a half-illuminated sphere from the "side" or slightly "behind" it (with reference to the source of illumination).

Mercury and Venus, both being closer to the Sun than the Earth are the only two other planets in the solar system which go through phases similar to the Moon when viewed from Earth. Both of them, on odd occasions present us with a blunted cusp. This is best explained by examining this drawing of Venus's blunted cusps.

Figure 4.1 is a generalized drawing of Venus showing the blunted cusp phenomenon. The cusp at the bottom of the drawing is normal, while the one at the top is blunt. One can also see a dark ring stretching part of the way around the blunted cusp. This dark ring is known as the Venusian polar collar. In the above drawing it could also be referred to as a "notch" since it appears as if a notch has been cut out of Venus. Mercury is a much smaller object in the telescope, and it suffers, on occasion, from a blunted cusp (without the collar of course). The polar collar is an atmospheric phenomenon on Venus which we shall discuss later.

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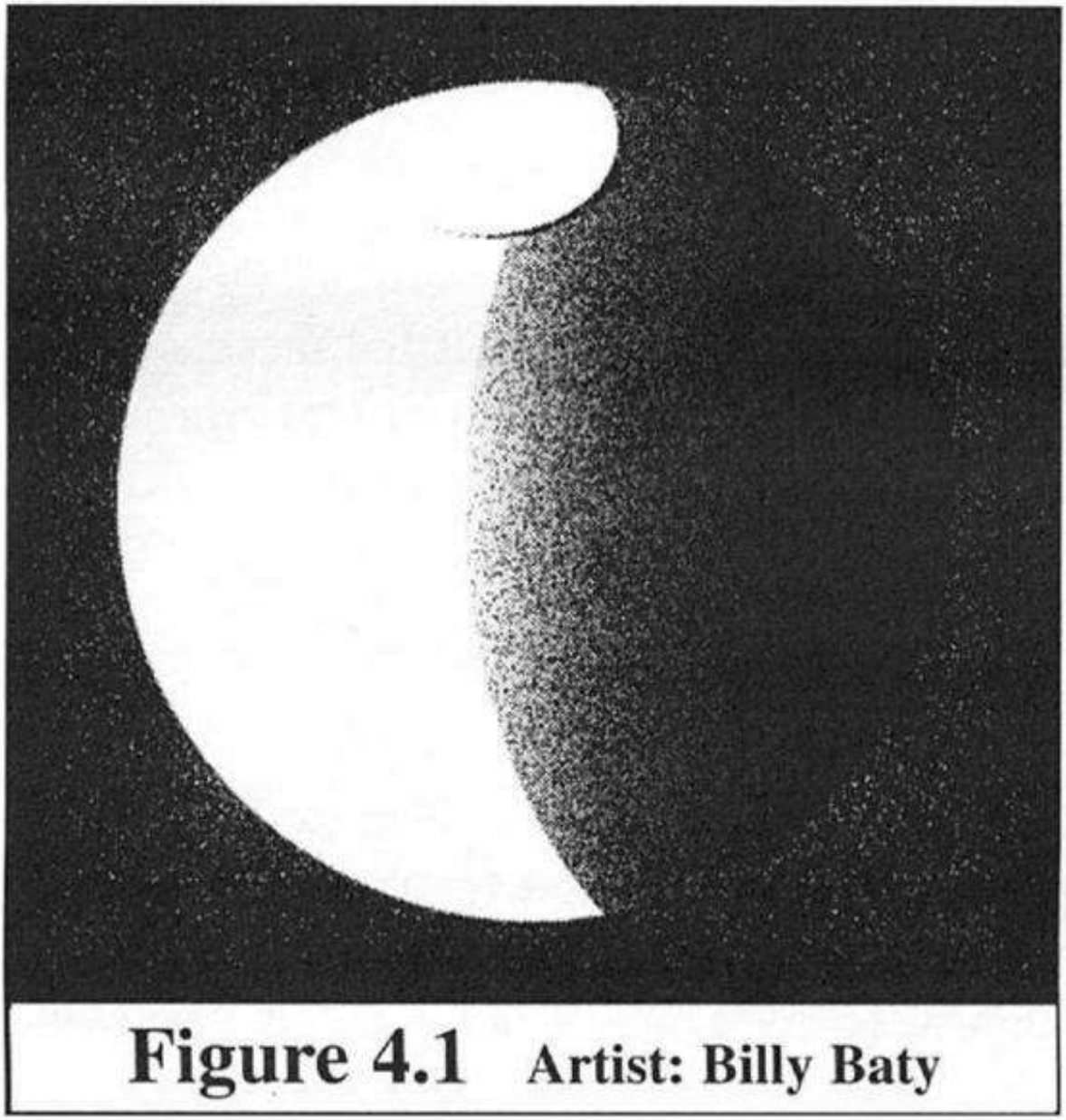

Figure 4.1 Artist: Billy Baty

Why would a cusp appear to be blunted? There are a few possible alternatives:

1. If the planet has an atmosphere then it may be a peculiar property of the atmosphere which may cause this bluntness. Perhaps the atmosphere may be darker in this region for some reason.
2. If the planet has no atmosphere, or a very thin one, then a darker area on the ground could cause this.

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3. The planet may be physically deformed in some way. In the case of Hollow Planet theory the obvious suggestion is that we have a depression leading into the interior cavity of a Hollow Planet.
4. An alternative to (1) above, for planets with extremely thin atmospheres might be that dust-laden air is expelled from inside the planet. This may create a temporary, dust-laden atmosphere in the polar regions thereby causing this temporal bluntness.

Mercury has a very thin atmosphere. For a long time astronomers supposed Mercury to have no atmosphere at all. So reason 1 above is not viable for Mercury. This leaves reasons 2, 3, and 4 as the only viable options.

Let us discuss the possibility of a physically deformed planet, one where a Polar Hole may be so large as to physically change the planet's shape. In other words the planet is not truly spherical, at this point at least. The curvature of a planet might not be easy to determine when you are looking at it directly, however as one views the areas which border on shadow, the shadows would give away the fact that there is a change in the curvature of the surface. Take a look at a Full Moon. The Moon looks circular, but you cannot determine the curvature of points near the center of the Moon since you are looking directly from "above" and the surface features are all lit up. But take a pair of binoculars or a small telescope and watch the Moon as it goes through its phases. Craters and mountains will deform the curvature of the Moon very slightly and you will be able to see this clearly with binoculars. The "terminator" (line between day and night) will appear ragged through binoculars or a telescope—whereas to the naked eye it appears a perfectly straight line.

The blunt cusp phenomenon however is a problem on a much larger scale. In Figure 4.1, the blunted cusp can be seen to be wider that the normal cusp. It would seem that the planet is "dented" at this point. This "dent" in the planet is causing the blunted cusp effect. What is causing such a dent? In the case of Venus, I suspect the presence of a gigantic hole in the crust which is causing the atmosphere to be sucked into the center of the planet. This dent may have a temporary effect on the planet's cloud cover.

Mercury has no detectable atmosphere which covers the planet, yet Mercury also suffers from a blunted cusp. One possible explanation is that Mercury has a similar hole in its crust or perhaps dust-laden air escapes by way of a smallish hole to create this effect? The blunted cusp phenomenon

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occurs on Mercury as well as seen in the drawing below. It is not quite as pronounced as on Venus, but it definitely exists.

In astronomical drawings the South Pole is normally at the top. The left-most drawing of the four, shows the blunted southern cusp (at the top of the drawing) clearly. Note how sharp the North Pole of Mercury is. The southern pole however, is rounded. Many observers have commented that the region surrounding the blunted cusp is unusually bright.

Patrick Moore, writing in 1955 pointed out that Schroter had noticed (back in 1800) that the southern cusp of Mercury was normally blunter than the northern one. He expressed the view that this is easily explained by looking at maps which have been drawn of that planet. These maps show the southern part of the disk to be much darker than the northern part.[7]

Some nineteenth century astronomers thought the blunting to be periodic and therefore a measure of the length of Mercury's day. They thought the blunting was the result of a physical feature. From careful observations of the blunted cusp's waxing and waning, Mercury was estimated to spin once on its axis every 24h, 50m. The currently accepted figure is 58.6 days. This does not bode well for any explanations based on the blunted cusp being due to a physical feature alone. This lays options 2 and 3 open to question. If this feature is caused by either a Polar Hole or a dark area it should be possible to predict exactly when the cusp will be blunted. No one has ever been able to do this.

While many have suggested that Mercury's blunted cusp is due to a dark area on the ground, there are others which have dismissed it as an optical illusion. Mercury has almost no atmosphere. How can an optical illusion occur on such a grand scale when there's no atmosphere to cause it? Why is the South Pole mainly affected? And why is the region exceptionally bright on some occasions? It is noteworthy that the phenomenon occurs at both poles, but most often at the southern pole. This suggests that we're dealing with a real phenomenon rather than a mere optical illusion.

The blunted cusp has been reported often. On 19 Apr 1864 the southern horn was blunted while the northern horn was sharp. A most interesting sighting was reported early in May 1923. The southern cusp was blunted while the terminator appeared to be irregular. This irregularity was because of an extremely bright bulge near the southern cusp. This bright bulge caused the entire terminator to look like a reversed "S" shape.[8] The following paper by Dale Cruikshank explores the possibility that the blunted cusp is caused

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by a dark physical feature:

> **For many years observers have reported that the south cusp of the crescent Mercury occasionally appears blunted as opposed to the usually sharp north tip**." Schroter noted this in 1800 and 1801; and, according to Antoniadi, the effect was confirmed by Burton, Noble, Franks, Trouvelot, Denning, and Antoniadi. The Jarry–Desloges observers (V. and G. Fournier) also noted this aspect from time to time, as well as small terminator deformations. Of this phenomenon, Schiaparelli says, "I must confess. . . that I have always seen the entire southern cusp very well though its light was weaker (than the north); and only once (5 June 1882) I found that cusp so little luminous, that from time to time, during the least distinct moments of vision, one could suppose it truncated. That unequal splendor of the polar regions is the real cause of the apparent truncation of the southern cusp. . .' [*Sulla Rotazione di Mercurio*, Astronomische Nachrichten, 123, 2944, pp. 242–50, 1890].
>
> Because of the brightness diminution at the cusps approximately according to the Lambert cosine law of diffuse reflection, usually imperfect seeing conditions, and general low surface brightness of the image, one expects to find the cusp tips on the limit of visibility. As Schiaparelli points out, however, the apparent truncation of the southern cusp is due to a darker region in that vicinity; and it is a purpose of this paper to determine whether observations in the ALPO files are commensurate with such an interpretation.
>
> Clearly, the planet is a complete sphere and observations of a blunted cusp simply represent inability to see the whole of what is really there. A dark region at the south cusp would produce the observed effect as Schiaparelli suggests; but of the planispheres extant, only those of Antoniadi, de l'Isle, and Wegner show anything of the sort in the proper place. The Dollfus photographic chart reproduced in Figure 1 [not reproduced] shows only a dusky continuum in this region, and **Schiaparelli's own map shows both polar zones quite light and devoid of detail**. We adopt the Dollfus map as generally the most reliable. This chart was made from composite photographs taken in 1942

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and 1944 by Lyot and Camichel, and shows no particular dark region sufficient to produce the observed effect. The Fourniers often noted dark markings at both cusps but omitted them from their 1920 planisphere. The drawings of B. Lyot also show dark polar markings. On the basis of these results and the fact that other planispheres show dark polar areas, we are led to conclude that the Dollfus chart is inadequate at the poles. Such is not an unreasonable assumption in view of the limits of the photographic process. This opinion does not imply that the central and limb regions of the Dollfus planisphere are incomplete, though I suspect that they are. We must mention that all of the planispheres discussed above (except Wegner's) are drawn for mean librations. Probably, then, we must look to the libratory regions for the cause of the blunted cusp.

Fifteen drawings in the ALPO files (9% of all drawings made with $k < 0.5$) show a blunted south cusp tip. At least one of these may be omitted because of bad seeing. Of the remainder, eight were made by Gary Wegner, three by C. L. Johnson, two by C. J. Smith and one by W. H. Haas. **Haas' drawing shows the north cusp rounded to the same slight degree as the south and probably indicates imperfect observing conditions**. **One of Wegner's drawings is similar**. Eight of the observations were made at an eastern apparition and six at a western so that no particular correlation is noted with respect to morning and evening apparitions. Figure 4.2 shows some representative views of the truncated cusps. These copies show only the limb and terminator; shadings and details are omitted.

Since the cusp is not seen blunted in a large fraction of the observations on hand, we may assume that the dark region near the presumed South Pole is a particular marking with definite boundaries. Then there should be a unique combination of latitude and longitude librations which puts the dark area in just the right place to give the observed illusion. Both librations were computed for the dates when blunted cusp observations were made, and the results are found in Table 1 [not reproduced]. It will be noted that there is a strong preference for positive librations (east limb exposed) when Mercury is at eastern apparitions and for negative librations (west limb exposed) when at western apparitions. This result suggests that a large distinct dark area on the sun-averted hemisphere is

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responsible for the appearance of the blunted cusp, one extremity at the positively librated eastern hemisphere (eastern apparitions) and one at the negatively librated western hemisphere (western apparitions).[9]

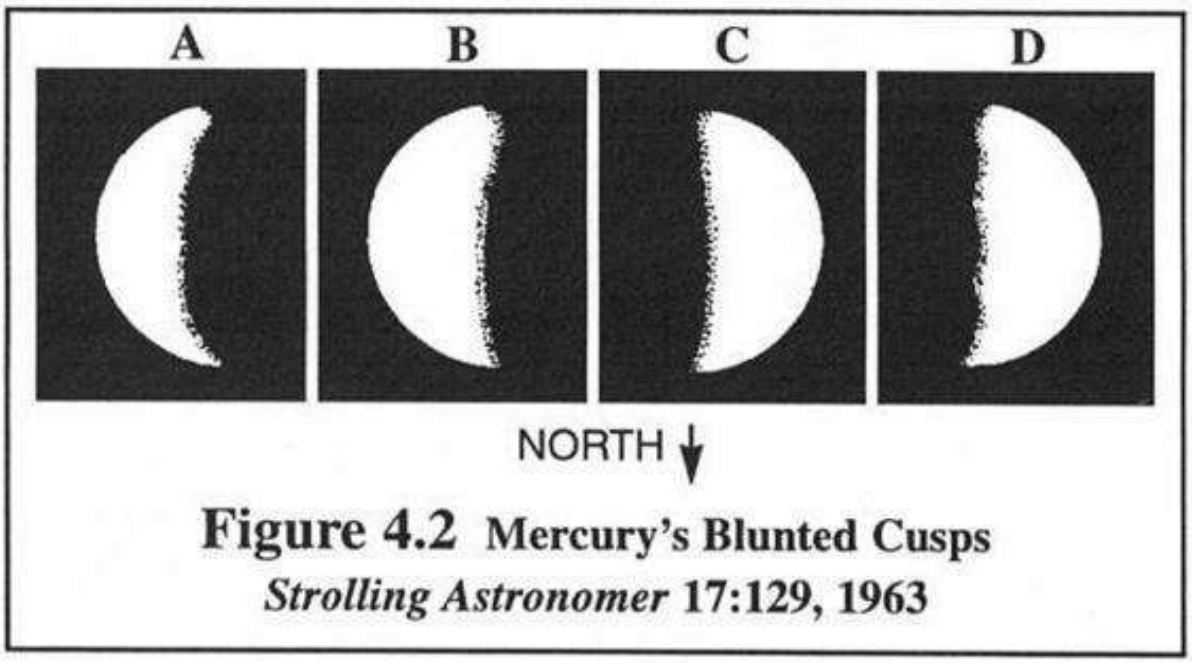

Figure 4.2 Mercury's Blunted Cusps
***Strolling Astronomer* 17:129, 1963**

Cruikshank tried to solve the problem by pointing to a specific dark region in the vicinity of the South Pole and to a lesser extent a similar dark region near the North Pole which could account for the blunted cusp. It is interesting that some drawings also show the northern cusp slightly blunted as well. The majority of the evidence suggests a blunted southern cusp.

Schiaparelli attributed the blunted cusp to contrast between the brightness of the different poles, and the fact that the tips of the crescent were at the limits of one's vision.

Cruikshank disposes of Haas's drawing which showed both cusps to be blunted. Haas is the gentleman who founded ALPO (Association of Lunar and Planetary Observers), the very organization which Cruikshank and other prominent planetary astronomers belong to. While some maps showed the polar regions of Mercury to be dark there were others which showed its polar regions to be bright!

Cruikshank also states that: "Clearly, the planet is a complete sphere"—thereby ruling out a spherical deformity as a possible explanation. By disposing of Haas's drawing of both blunted cusps, as well as Wegner's

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similar drawing, he then preferred to search for the answer by looking for a dark area at Mercury's south polar region.

His reference to libratory regions is interesting. It was only in 1965 that Pettengill and Dyce used radar to determine the rotation period of Mercury as 58.6 days. Until then it was thought that Mercury always presented the same face to the Sun (as the Moon does with the Earth). This is why Cruikshank refers to the libratory regions. He thought that perhaps the planet rocked slightly from side to side and that dark areas not normally visible would then come into view causing the blunted cusps.

Cruikshank felt he had solved the problem. He suggested that a dark area would account for this occasional blunting effect. It was thought at that time that Mercury behaved like our Moon. Two years after Cruikshank thought he had found the answer to the problem it was discovered that Mercury has a rotation period of 58.6 days. Since then, astronomers have produced new albedo maps of the entire planet. Yet there are no dark areas which could account for the blunted cusp itself.

Earlier this century Antoniadi believed he had evidence showing that there were clouds on Mercury. In an e-mail to me dated 3 May 1998 Richard Baum of the British Astronomical Association had this to say:

> The clouds on Mercury as observed by Schiaparelli and Antoniadi and others are now widely believed to be misidentifications due to the fact no one then appreciated the planet had a rotation period less than its period of revolution. At one time dust was held to be responsible. Almost certainly now the observers were mistaken as explained.

This conclusion seems to me to be rather premature. This conclusion is only valid for long term albedo changes on Mercury. Mercury rotates very slowly. If albedo changes were to occur within a few hours or within a few days one cannot then dismiss it as being due to a faulty knowledge of Mercury's rotation. We can therefore ignore Antoniadi's longer term ideas. But short term changes still remain unexplained.

After Mercury's true rotation period had been discovered Cruikshank then tackled the problem again, but from a different angle. Many scientists have regarded the Moon and Mercury as similar bodies having similar behavior. Cruikshank decided to try this angle as a possible explanation. In a paper he wrote in *Nature* in 1966 he commented on the possibility of there

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being luminescent effects on the Moon. This had been discovered by a number of scientists using various photographic and spectroscopic techniques. These scientists had suggested that this luminescence was caused by interaction with the solar wind. This implied that other planets which had no atmosphere might also be affected.

Cruikshank commented on Antoniadi's experiences:

> Fluctuations in the intensity of portions of the surface of the planet Mercury were recorded by Antoniadi, **who regarded the apparent obscuration of dark areas as the result of variable cloud cover. From his extensive observations with the 33–inch Meudon refractor**, **Antoniadi concluded that the density and extent of the 'clouds' varied with the changing distance of Mercury from the Sun**, **probably reaching maximum at perihelion and minimum after aphelion**.

Like Baum, Cruikshank noted that Antoniadi's ideas of long-term changes occurring on Mercury were probably wrong because they were based on the flawed idea that Mercury's rotation was 88 days long. But the short term changes which occurred on Mercury could not be explained away in this manner. Cruikshank wrote:

> Antoniadi also noted, however, that changes occur on Mercury in a few tens of hours, and these cannot be simply explained in terms of the shorter rotation period. Other observers have also reported short-period changes on Mercury.

Cruikshank knew that this was fact because from 1958 to 1964 he had studied Mercury using various telescopes up to a massive 82 inches in size. Cruikshank concluded:

> . . . my observations generally confirm that variations in the intensity of certain of Mercury's markings can occur in a matter of several hours or days.

He examined four good drawings of Mercury done in 1963 (Reproduced as Figure 4.3) under good seeing conditions within nine days of each other. While conceding that drawings A and B might have been different due to the

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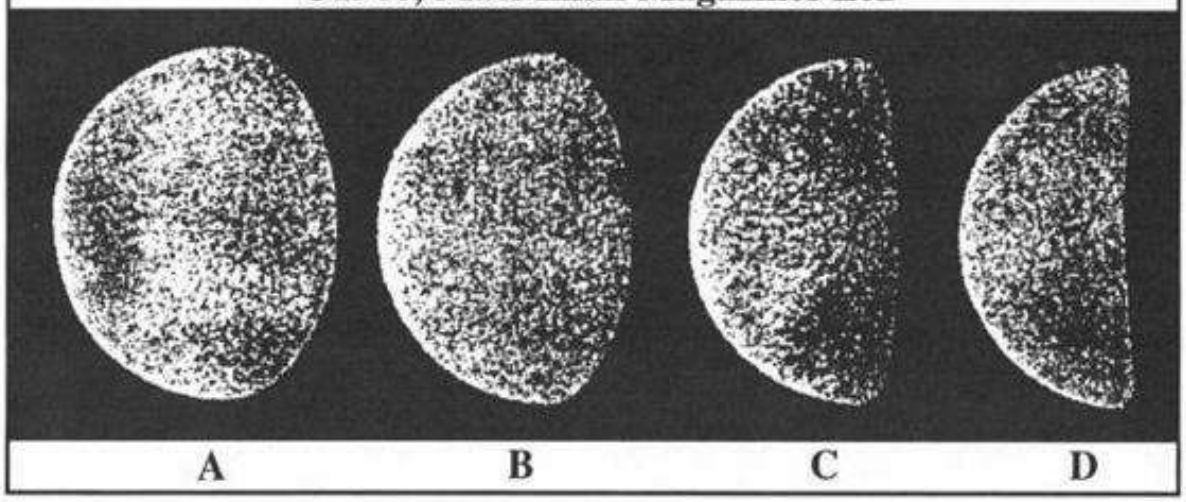
resolving power differences between the telescopes used, he nevertheless felt that something real had happened:

> Between the first and last drawings . . . a darkening at the south cusp is apparent. Later drawings made as the crescent waned show the south cusp darkening further until it was the darkest region on the planet.[10]

Figure 4.3 Reprinted with permission from *Nature*, 209:701, ©1966, MacMillan Magazines Ltd



Take a look at Cruikshank's four drawings in Figure 4.3. The South Pole is at the top (a convention used in astronomy). It seems as if the changes are not confined to the south polar region only. In drawing C, both polar regions have become darker and are equally dark. In D the north polar region is even darker than the south polar region. Cruikshank goes on to state that later drawings show the south cusp becoming even darker until it is the darkest region on the planet. Could it be that we are witnessing two enormous dust storms taking place in the polar regions of Mercury at the same time?

Mars, with its very tenuous atmosphere can have dust storms which cover the entire planet for weeks on end. If a thin atmosphere on Mars can sustain dust storms then perhaps something similar can happen on Mercury—except that this may be related to air actually moving into and out of the planet. This may also provide us with the key to the location of any holes in the planet's crust. Could there be a small Polar Hole at each pole from whence this air is emanating? Perhaps if one studies Mercury thoroughly

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enough one will be able to determine the exact location of these holes?

It is interesting to note how Mr. Cruikshank's own experiences matched exactly those of the astronomers of the last century. In his previous paper, he ignored the evidence which did not suit his purposes, yet when he finally decided to study the matter with large telescopes he found exactly the same things happening before his own eyes. He surely knew all along that changes happen rapidly on Mercury, yet he chose the libration "explanation" the first time around. Also note the size of telescope he used. At one point he used an 82–inch telescope, then a 36–inch and finally a 12–inch telescope. Antoniadi made many of his observations with a 33–inch telescope. Antoniadi's telescope was the finest in Europe.

Cruikshank tried to explain the blunted cusp as part of a larger phenomenon. He tried to relate the varying brightness of Mercury to a similar occurrence measured on the Moon. He then tried to explain the blunted cusps away with the same phenomenon.

Antoniadi had believed that this varying luminescence was due to clouds crossing the surface of Mercury. Since Mercury is such a small and difficult object when seen in a telescope from the Earth, not even Antoniadi saw clouds directly on its surface. The clouds were implied because of the strange changing brightness of the planet.

I would like to address a problem which has been largely ignored. And that is the length of time it has taken astronomers to determine the rotation period of Mercury. The problem is essentially quite simple in the case of Mercury. Mercury has virtually no atmosphere, for much of this century astronomers were convinced that it had no atmosphere at all. Mercury has been likened to our Moon on many occasions. It is similar in size, has a surface covered with craters and its mass is too small to hold an atmosphere. As someone with very limited astronomical ability, I can well appreciate how difficult Mercury is as an object in the sky. Due to Mercury's proximity to the Sun it is a very difficult object to view. It is very small and is seen indistinctly even in the largest telescopes.

Astronomers have however tried to produce albedo maps showing the dark and bright areas of the planet. If Mercury is Moon-like and has no atmosphere it should then be a relatively simple case of finding the single most prominent feature on the planet and then watching the planet over a period of time and noting when this feature appears. Even if this is seen over many weeks and months, one can then work backwards and determine very

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accurately the rotation period of the planet.

Mercury's rotation period was never discovered in this way. Not by Antoniadi, nor Cruikshank nor anyone else. Not with 30–inch or even 82–inch telescopes! Why should this be so difficult? Perhaps, you might argue, Mercury is so small that even with the largest telescopes one cannot see any features on its surface? This is clearly not a valid argument because astronomers have been producing albedo maps of Mercury for a very long time and these are still used. Relatively small features can be seen on these maps. Now if Mercury is something like our Moon which has dark "seas"—then it should be quite a simple issue to determine the rotation period of the planet.

But it is not so simple. Cruikshank, using an extremely large telescope notes that Mercury's brightness could vary with extreme rapidity. Cruikshank quotes Antoniadi's observations that Mercury's brightness can change considerably in a few tens of hours. Such a period is far too short to be accounted for by a slow rotation of 58.6 days—as Cruikshank concurs.

Could this astronomical difficulty be explained if we were to assume there are winds blowing across Mercury? Could wind blowing across its dusty surface be stirring up dust clouds which then change its albedo? Could this be why its brightness changes so rapidly? Could this be why astronomers' maps of Mercury are so different? Could this be why no one has ever (to this day) been able to determine its rotation period visually? Could there be wind blowing on an "airless" world?

So Cruikshank opts this time for varying solar induced luminescence as the explanation. Would this mean that perhaps the Haas and Wegner drawings may now be admitted as evidence again—since the phenomenon occurs all over Mercury? It would seem that Cruikshank has changed his mind. It is clear from Cruikshank's own experience and his quoting of Antoniadi's work, that he is now thinking more in terms of large scale changes across the face of Mercury—changes which can occur on the scale of a few days or even hours!

Mercury is a small, dry, sun-baked planet about 3,000 mi in diameter compared to the 2,160 of our Moon. Like the Moon it has too little mass to hold on to an atmosphere:

> **Theoretically**, **the mass of Mercury is too low for an atmosphere to have been able to form and persist**. . . Furthermore, the daytime

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> temperatures are high because of the proximity of the Sun. The result is that the thermal velocities acquired by molecules degassed at the surface are much greater than escape velocity. The very low atmospheric pressure determined by observations in the ultraviolet during the passage of Mariner 10, 10,000 km from the surface, **corresponds to values in the exosphere of the Earth at an altitude where collisions between molecules are practically nonexistent**. The only definitely known atmospheric constituent is helium. The existence of this light gas in the atmosphere may be explained by the beta-decay of uranium and thorium in the crust of Mercury.[11]

At the time Mariner 10 passed by Mercury it found no indication of an atmosphere. What it found was a virtual vacuum.

If the blunted cusp were due to a physical feature, such as a dark area, then why hasn't it been mapped long ago? In fact, such a dark feature would have revealed the exact rotation period of Mercury. I doubt that the blunted cusp can be explained in such simple terms for there are other mysterious atmospheric phenomena which also point to some unexpected climatic conditions on Mercury.

Antoniadi was one of the finest astronomers who ever lived. When Percival Lowell was seeing canals on Mars, it was Antoniadi who was able to demonstrate that the resolution of Lowell's telescopes was the cause of the problem. Antoniadi was able to show that these features were composed of smaller indistinct features. Antoniadi's conclusions are accepted by scientists today. Antoniadi was using the largest telescope in Europe. But the one problem Antoniadi struggled with, and which no one could solve, to this day, is what is happening on the surface of Mercury.

Cruikshank is a professional astronomer and his observations took place in the mid-1960s. This phenomenon cannot be written off as an illusion caused by faulty telescopes, or the small aperture telescopes (15–20 inches) which caused astronomers to see the Martian canals. Unlike the Martian canals, this phenomenon is still seen in very large instruments. This phenomenon is real and reproducible, hence Cruikshank went to great lengths to try to explain it as best he could with the limited scientific concepts at hand.

Mars darkens at various times of the Martian year. This was once thought of as being due to the existence of vegetation. Now it seems this

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darkening is due to “annual” windy weather. Martian winds, howling along at incredible speeds in the very thin Martian atmosphere, pick up dust and sometimes the entire planet is covered in one huge dust storm. What if something similar happens on Mercury? What if dust is stirred up over large areas?

I propose that the blunt cusp phenomenon on Mercury is caused by air being pushed out of Inner Mercury. The reason the poles are most often darkened must be because the holes which lead into Inner Mercury must lie somewhere in the polar regions of that little planet. If the air comes out at a low velocity it then stirs up dust only in the vicinity of the Polar Holes, thereby rendering the surface invisible. If the pressure is much greater, such winds might reach areas much further from the poles, thereby causing those rapid changes in brightness which both Antoniadi and Cruikshank saw.

That the southern cusp is darkened the most often, perhaps indicates that the largest hole in Mercury’s crust exists in this region. A great volume of air exiting from it would then cause a more extensive darkening of its south polar region.

There is no physical feature of any note at the North Pole. However, at the South Pole there is a large crater called: Chao Meng-Fu. It is approximately 100 mi in diameter and its one edge touches on the South Pole. Could this crater perhaps be somehow linked to the blunted southern cusp? This is mere speculation on my part. Perhaps Chao Meng-Fu or some other crater may be of volcanic origin and perhaps such an extinct volcano might have a large enough tunnel which reaches through the crust into the interior of a hollow Mercury?

The Inner atmosphere might escape due to the Mercurian Inner Sun becoming excited, perhaps in sympathy with Solar changes. We will examine this link later when studying the Earth. This may also explain the apparent link between Solar luminescence and the appearance of this atmosphere. An excited Inner Sun might cause violent weather inside Mercury, causing some of its atmosphere to be forced out on to the surface. This atmosphere may then, over a period of time (perhaps weeks), slowly seep back in through various cracks, being forced in by gravity.

The Reader should keep in mind that the planets are very old, and if they keep losing their atmospheres, as scientists propose, then a world like Mercury would be atmospherically “dead” by now and there would be no wind. Yet, gravity, as I pointed out in an earlier chapter, may behave quite

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differently to our poor understanding of it, and it may be that even small planetary bodies such as Mercury, or our Moon, might actually retain their atmospheres—even when these are forced out of the Inner cavity. Thus it may be that planets never really lose their atmospheres at least on a large scale.

In connection with this, one should not forget that Titan, one of Saturn's moons is slightly larger than Mercury but with less than half the mass of Mercury. It has a very thick atmosphere with an atmospheric pressure greater than that of the Earth! The reason why Titan has an atmosphere, and why Mercury does not, is that Mercury is extremely hot and this excites the atoms too much and hence they fly off into space. That's what scientists think. But is this really so?

I contacted Dale Cruikshank to ask him his views on Mercury, more than 30 years after he did the above two analyses. Excerpts from his reply to me on 30 Oct 1997 are:

> I have observed several of these phenomena myself, both with amateur telescopes up to 12–inches in size, and with professional telescopes of all sizes. My visual observations have been made with telescopes up to 88–inches in size (the Univ. of Hawaii 88–inch telescope at Mauna Kea; I was on the research faculty there for nearly 18 years), and I am an experienced user of telescopes of all sizes, including the largest telescope in the world—I have just returned from 3 nights on the Keck I 10–meter telescope at Mauna Kea. In addition, the photometric, radiometric, and spectroscopic studies of the planets and their satellites have been my major research activity since 1962. To respond specifically to your questions, I would make the following remarks:
>
> 1. Blunted cusps of Venus and Mercury. This is purely an optical effect of the low contrast in the visual images of both Venus and Mercury. There are times when the polar regions of Venus are a bit darker (primarily when seen in ultraviolet wavelengths) than other parts of the disk, and this probably contributes to the apparent blunting of the cusps, particularly to observers whose eyes are somewhat sensitive in the blue and UV spectral regions. I have seen this myself, but I do not attribute it to anything unusual or mysterious. It is purely an optical effect and does not indicate anything particularly unusual (or diagnostic) happening on

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> Venus. Similarly with Mercury, low contrast in the image can cause an apparent blunting of the cusps, and while this may be related to the distribution of relatively light and dark regions on the planet (as seen in Mariner images), this optical contrast effect does not in itself indicate that anything unusual or mysterious is happening on Mercury.

And yet, 30 years before, Cruikshank was making exactly the opposite argument. Too many reliable observers had reported these phenomenon. Another observer whom we shall meet up with is Richard Baum, the current Director of the Mercury and Venus sections of the British Astronomical Association. Both he and a prior Director of the same section have spent an even longer period of time trying to prove the reality of the blunted cusps. Haas, the founder of ALPO, also drew these.

As will be seen, Cruikshank's reply above is not consistent with the facts because some observers (note the 1923 observation for example), stated that the area around the blunted cusp was very bright. The Venusian cusps are especially bright. Cruikshank's attempt to pretend that this phenomenon is well explained is indeed hard to believe especially after all that has been written about it—including him.

As can be seen, his earlier attempts at accounting for the phenomenon, by postulating a dark region on the sunlit side of Mercury failed. I think Cruikshank has committed an error by attempting an outright denial of the existence of the blunt cusp phenomenon. This topic will be revisited in even greater detail in the chapters on Venus. I think the reason Cruikshank thinks there's "nothing mysterious" going on is simply because he cannot come to grips with the bizarre nature of the phenomenon. He will never have considered that this phenomenon could possibly be caused by wind exiting the Polar Holes of a Hollow Planet.

ANTONIADI'S CLOUDS

According to Newtonian gravity and our current knowledge of physics Mercury's mass is too low for it to retain an atmosphere. For example, Guy Israel writes:

> Theoretically the mass of Mercury is too low for an atmosphere to have been able to form and to persist. The escape velocity is only 4.3 km/sec. Furthermore the daytime temperatures are high because of the proximity

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> of the Sun. The result is that the thermal velocities acquired by molecules degassed by the surface are much greater than the escape velocity.[12]

Israel goes on to state that the atmospheric pressure is akin to that of the Earth in the exosphere where virtually no collisions occur between particles. In a nutshell he is saying that the Mercurian atmosphere is almost nonexistent and for most practical purposes it is a near vacuum. The view of Israel above, and of most other astronomers throughout this century has been the same. Mercury, according to our understanding of physics cannot have an atmosphere.

If our science is correct, then Mercury should be an “open and shut” case. But it’s not. There has been quite a debate over the years as evidence surfaced which showed that Mercury seemed, at times, to have an atmosphere.

Mercury is a difficult object in a telescope, and even Sir William Herschel, the discoverer of Uranus was unable to see any surface markings at all on Mercury. As telescopes improved later observers began to see markings and to make maps. Considering that Mercury is, to this day, regarded as unchanging as our Moon, it is amazing how assiduous astronomers struggled to determine the rotation period of that planet, and to draw reliable maps of it. These scientists arrived at a general consensus after decades of assiduous study. This consensus turned out to be wrong. It was Johann Schroter who constructed the first proper chart of the planet and believed that he had detected definite and permanent markings. His map was considered unreliable because of “discoveries” such as an 11 mi high mountain!

The keen-eyed Italian astronomer, Schiaparelli, was the first to draw a reliable map of Mercury. Schiaparelli made most of his observations in broad daylight. Between 1881 and 1889 he plotted a number of dark, well-defined streaks and patches.

Schroter thought Mercury took 24 hours to turn about its axis, but Schiaparelli’s work led him to believe that Mercury kept one hemisphere permanently turned towards the Sun, with the other in perpetual night. This meant that Mercury revolved about its axis in 88 Earth days.

In 1934 even the great Antoniadi thought that Mercury presented the same face to the Sun. He wrote:

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> The annulled rotation of Mercury with reference to the Sun, suggested theoretically by Kirkwood and Sir George Darwin, and confirmed visually by Schiaparelli, **is an established fact**.[13]

Commenting upon Schiaparelli's determination of an 88 day rotation period, Patrick Moore, the famous English astronomer wrote:

> Recent studies have shown that he was right, and . . . One hemisphere is perpetually scorched by the solar rays, while no gleams of sunlight ever penetrate to the far side.[14]

Antoniadi and Moore were merely echoing the views of astronomers until 1965 when it was discovered, by radar, that Mercury rotated about its axis in 58.6 days—and not 88. This shows how the general consensus of the finest minds can therefore also be wrong, can it not? So much for "established facts!" Moore acknowledged the contribution of Antoniadi:

> The most valuable observations of Mercury yet made have been carried out by French observers—first by E. M. Antoniadi and more recently by Dr. Lyot and Dr. Dollfus. Antoniadi worked with the largest refractor in Europe, the 33–inch telescope at the Observatory of Meudon (with which I have had the privilege of making extensive lunar observations), **leaving no doubt in my mind that it ranks with the finest instruments in the world**, and Lyot and Dollfus with the 24–inch refractor of the Pic du Midi Observatory, situated high in the Pyrenees above the densest and most troublesome layers of the Earth's atmosphere.[15]

Antoniadi's chart agreed reasonably well with Schiaparelli's. Moore described Dollfus's 1950 chart of Mercury as the most detailed produced up until 1955. Dr. Werner Sandner, of Germany, had also produced an excellent map of Mercury.

Moore wrote:

> However, we must admit that our knowledge of the 'geography' of the planet is anything but complete. Large telescopes are needed to show anything definite.[16]

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Moore, as an experienced astronomer, thus feels that large telescopes are capable of showing the observer something "definite." He gives a more accurate description: "The Mercurian markings are grey, fairly well defined, and permanent, showing up against a generally pinkish background."[17] While rejecting the 11 mile high mountain, Moore noted that the Mercurian terminator (the line between day and night) was not always perfectly straight. He felt that this suggested mountainous terrain. We now know Mercury is heavily cratered. I cannot help wondering if the strange changes in Mercury's terminator might not also be related to dust storms and other atmospheric effects?

It would seem that even though Mercury is a difficult object, the astronomers did manage to see something valid on the surface. Although telescopes do not have the resolving power of a satellite, they nevertheless allow the "real time" study of a planet. Instead of looking at still pictures of the planet taken hours or days apart, astronomers using telescopes can observe real-time events. They can also watch for considerable periods of time.

Moore discusses the Mercurian atmosphere: "For many years it was uncertain whether or not Mercury possessed any sort of atmosphere. A thick air-mantle was not to be expected. . ."[18] Moore then comments: "It is easy to prove, observationally, that the Mercurian atmosphere is not appreciable. From time to time the planet passes in transit across the Sun, and it then appears as a sharply defined dark circle." He uses as an example, a drawing made by Dr. H. P. Wilkins on 6 Nov 1914. He continues: "A dense layer of air around Mercury would cause a blurred appearance, as is actually the case for Venus."[19] Moore notes: "Strange appearances have been reported during past transits, but it seems that all these must be put down to defects in eyes or instruments."[20]

Moore makes these comments about possible clouds:

> **On the other hand**, **both Schiaparelli and Antoniadi agreed that the dark markings of Mercury were often veiled by whitish clouds**, **and Antoniadi even stated that these clouds were 'more frequent and obliterating than those of Mars'**. Needless to say, there was never any suggestion that the clouds were in any way like those of the Earth; water-droplets on Mercury would be as short-lived as snowflakes in a blast-furnace. **Until very recently**, **the existence of clouds of some sort**

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> **was regarded as definitely established;** but observations made at the Pic du Midi led Dollfus, in 1953, to state that he 'had never seen a modification of the aspect of the surface definitely attributable to atmospheric clouds', and that the evidence in favor of them was far from conclusive, so that the whole question seems to be open once more.
>
> Dollfus has, however, detected the presence of a tenuous atmosphere. It is thin, the ground density cannot exceed .0003 of the Earth's, and corresponds to what is normally described as a laboratory vacuum; a barometer would record a pressure of only about one millimeter, which is negligible. We can only guess at its composition, but carbon dioxide seems to be a strong possibility, as the feeble pull of Mercury would be sufficient to hold it down.
>
> Even this thin air-mantle would probably be capable of supporting dust, and **if Antoniadi's clouds really exist they are almost certainly veils of dusty material**. **However**, **it is not easy to see just how they could spring up**. **The winds in the tenuous atmosphere would be unable to cause violent dust-storms**, and neither are volcanic eruptions to be expected upon a world as dormant as Mercury. Still, it is pointless to speculate upon the origin of the clouds until we can be quite certain that the clouds themselves exist.[21]
>
> Antoniadi wrote the following about Mercury in 1934:
>
> With its dark yellowish color and grey spots, that planet recalls to memory our Moon, **although the enormous whitish veils**, **which so frequently fade**, **or blot out**, **its markings**, **establish beyond doubt the existence of its highly rarefied and invisible atmosphere**. **Whether those clouds**, **which have regions of predilection**, **are due to dust raised by the violence of winds**, **or to some inconceivable electromagnetic action of the Sun**, **so powerful at the distance of Mercury**, **it is impossible to decide**.[22]

Antoniadi's description of "enormous whitish veils" is highly suggestive of clouds, much as we understand them, here on Earth. They are of course completely out of place on Mercury. He also mentions that the clouds ". . . have regions of predilection. . ." which suggests that they are linked to certain

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physical features on the planet's surface-holes in the crust somewhere perhaps?

I asked Dale Cruikshank for his thoughts on the existence of a Mercurian atmosphere. On 30 Oct 1997 he replied as follows:

> Antoniadi's 'clouds' on Mercury are a puzzle that I have wondered about for a long time. I wrote a paper about my own observations (with a small telescope) of possible anomalous regions on Mercury [*Nature*, 209, 701, 1966. Author's note: This was quoted earlier], but I have also written papers about the extremely weak atmosphere of the planet. In summary, I think that Mercury can have a significant transient atmosphere, possibly related to crustal activity (even volcanism is possible, though not likely) and/or the sputtering of material from the surface by the solar wind. If this transient (and localized) atmosphere can ever reach substantial density, then optical effects of the kind described by Antoniadi might really occur. Another possibility is that dust is levitated from the surface of Mercury by electrostatic charge build-up, possibly induced by the solar wind.
>
> I think you can keep this one on the books as a genuine unanswered puzzle of science, and I hope that a future mission to Mercury will help solve it. I have every confidence that this issue will be resolved as an interesting but straightforward problem of the physics of the surface and atmosphere of Mercury.

According to the personal testimony of Patrick Moore, himself an astronomer of note, the Meudon refractor used by Antoniadi is a very fine instrument. Antoniadi was certain that the short term changes on Mercury were caused by clouds. Cruikshank suggests the existence of a "transient" atmosphere. He supposes that it might be due to "crustal activity". It is fair to say that there was no deficiency in Antoniadi's equipment, and Antoniadi is widely recognized as an astronomer of considerable ability. Cruikshank nevertheless steers clear of other evidence which seems to me to be related to the atmospheric phenomenon on Mercury. There seems to be a strong case for a relationship between activities in the polar regions of Mercury, and its transient atmosphere. But at least Cruikshank agrees that the phenomenon is real.

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In his 1963 book *The Planet Mercury*, Dr. Werner Sandner went through all the features of Mercury, using Antoniadi's map as his point of reference. Antoniadi compiled this map during the years 1924 and 1927–1929. Dr. Sandner made many pertinent comments about possible atmospheric phenomenon, and even possible changes on the surface of Mercury in recent decades. We must of course be careful of inferred long-term changes on the Mercurian surface prior to 1965 since that would be based on an invalid rotation period. Nevertheless, there is strong short-term evidence suggesting some kind of atmospheric activity on this supposedly dead planet.

Sandner noted that the area named Solitudo Promithei is a grey region near the South Pole and that Antoniadi had seen it obscured by cloud in 1928 and 1929. Antoniadi also stated that Solitudo Hermae Trismegisti was always visible—even under the poorest seeing conditions. Sandner, Cruikshank, and Antoniadi attribute the blunt southern cusp of Mercury to the dark area, Solitudo Persephones which is extremely dark and stretches from latitude -60° to the South Pole. Haas referred to this as the 'South Polar Band'. Schiaparelli on the other hand never had this large, dark feature marked on his map. Antoniadi also noted atmospheric phenomena in this region.[23] Dr. Sandner then addresses the issue of short term changes on Mercury:

> . . .Schiaparelli, and later the Fournier brothers and particularly Antoniadi, recorded comparatively frequent temporary changes in the appearance of certain features on Mercury. **All these observers have mentioned whitish arcs and bands in the vicinity of the limb of the disc**, **as well as fading and reappearance of the dark markings**, **the cycle often taking no more than a few days**. **Antoniadi in particular recorded numerous instances where individual features have been obscured**, **an effect which can only really be explained by atmospheric phenomena of some sort (dust storms**, **for instance)**.
>
> **The Fournier brothers mentioned changes in the brightness of the north polar region**, **and Antoniadi also remarks that at the time of easterly elongation the northerly pole cap sometimes appears brilliant white**, **while at others it is merely pale**. Even Haas, who has studied these problems extensively, has arrived at the conclusion that, apart from changes in appearance due to the phase and heliocentric position of the planet, occasional temporary changes have definitely

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> been detected; in fact, he differentiates between several types.[24]

The mention of whitish arcs and bands on the limb (edge) of the disk is highly suggestive of clouds as we know them. Such a suggestion borders on madness of course because clouds as we know them cannot exist on Mercury. Or do they? According to our physics this cannot possibly be so, but what if our physics is wrong?

Of particular importance to us is mention of the brightening of the Mercurian polar cap. This is utterly nonsensical as well. Why would the Mercurian polar caps suddenly become brighter? Are these clouds which are suddenly being produced in the polar regions of Mercury? Or is this ice being deposited at the polar caps for a short period of time? Or is it a combination of both phenomena?

An observation of what might have been an enormous cloud bank occurred in 17–25 July 1885. This series of observations took place in Bloemfontein, South Africa.

> July 17. Observed Venus and Mercury soon after sunset, before ‘glow’ appeared, and as soon as eye settled to eyepiece, I thought to see a small white, horn-like point, near or on bright limb of Mercury, some 30° from (inverted) south cusp on terminator. Thinking it an illusion, I observed bright limb all around, but no other similar object was seen; slightly averted vision also always distinctly revealed it. A more careful examination placed it at about 55° from (inverted) south cusp. A few minutes later fancied to see a whitish patch deeper on bright limb, and perhaps a little further south (inverted); it narrowed towards bright limb, and widened slightly on the bright disc. Planet’s color a reddish golden yellow.[25]

Similar observational notes followed for 6 more days, during which the spot changed shape. The movement of this spot is depicted in a series of drawings in Figure 4.4.

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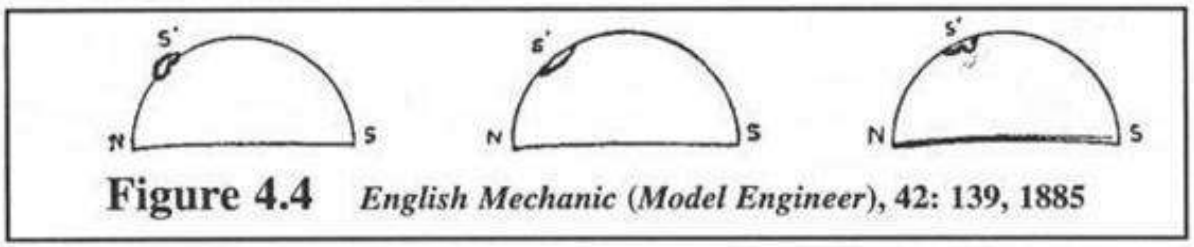

Figure 4.4 *English Mechanic* (*Model Engineer*), 42: 139, 1885

The movement of the white spot away from Mercury's south polar region, its whiteness, and its changing shape is strongly suggestive of a massive cloud formation. Clouds on Mercury? Clouds on a planet with hardly an atmosphere? Clouds moving away from the South Pole? Had an enormous cloud bank emerged from inside the planet? All these suggestions of mine border on insanity according to our current scientific knowledge, but how else can these things be explained?

ICE CUBES IN HELL

There may be another indication that Mercury has an atmosphere inside it. Where does the ice come from which was found at its poles? And is it as old as scientists say it is? Various scientists and writers have pointed out that the temperature at the Mercurian equator reaches a staggering 800° F. This, they argue should cause Mercury to have been "baked bone dry." Mariner 10 had also found no evidence of water on Mercury in 1974. This changed due to a surprise announcement in 1991. Scientists were amazed when their very powerful Earth-based radar revealed a highly reflective patch at Mercury's North Pole. Since ice reflects very well it was thought that this was caused by ice. Calculations showed that this was possible. The polar temperatures on Mercury can plunge to -235° F it on its polar night side. It was thus thought that some water vapor in the planet's thin atmosphere might freeze in the polar regions thereby creating ice or frost caps. The ice patch was estimated to be 640 x 300 km in size.

But if there had always been ice at Mercury's poles then why had Mariner 10 not detected it back in 1974? The explanation proffered was that perhaps this ice patch had been covered in dust at the time. The ice would still appear as a bright patch to Earth based radar because radar could see through the thin layers of dust.

Scientists were definitely surprised at finding polar ice so close to the Sun. Where did it come from? Some scientists proposed that "passing comets

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and asteroids" might be responsible for dumping some of their water on the planet.[26]

By 1994 new facts had surfaced. Researchers at the National Astronomy Center and at the Jet Propulsion Laboratory had found that the ice was contained in "lakes" cupped in polar craters miles across. These "lakes" were always shielded from direct sunlight.

Researchers had expected all Mercury's water reserves to have boiled away long ago in the hellish conditions which prevail on its surface. One UCLA planetary scientist commented: "It is like finding snowballs in hell." But the radar echoes from these patches were definitely characteristic of ice.

Paige, one of the scientists, suggested that the permanent shadows in the vicinity of the poles would cause the temperature in the crater floors to remain at well below 32° F. In this way the frozen water could be preserved for billions of years. Paige's theory was born out by further studies. Detailed studies showed that the reflective patches lined up with known craters on Mercury. The older and more eroded craters however did not contain reflective patches. This suggested that the ice lay in the bottom of craters which were shielded from the glare of the Sun.[27]

According to Paige, the bright spots exist at both poles. The ice they discovered lies underneath a thin layer of dust in craters where the Sun's light never reaches. They then state that this ice must be millions of years old. Why? Simply because there is no mechanism on Mercury today which can create that ice. However, I wonder about that. In the map of Mercury drawn by Gary Wegner in 1960, it clearly shows a bright spot at the South Pole of Mercury. We also have the testimony of other astronomers including Antoniadi that at times the Mercurian polar regions become very bright. This then fades away.

What if the ice were formed by atmospheric phenomenon related to Mercury being hollow? The side of Mercury facing the Sun has temperatures averaging 430° C (800° F) while on the dark side temperatures may reach -170° C (-270° F). If the ice deposits were formed recently they would evaporate very quickly except for that lying inside craters hidden from direct sunlight. Such deposits would soon be covered in dust if storms were sweeping across Mercury. I think it is unlikely these ice deposits were left by passing comets or asteroids thousands or millions of years ago. The eye-witness testimony of some of the finest astronomers this century suggests to me that the ice is of recent origin.

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Let us go back to an observation quoted earlier of an extremely bright bulge near the southern cusp. I have mentioned the strange brightening sometimes seen near the blunted cusp. It is very strange that as one part of the cusp becomes darker and disappears, that areas bordering on it should be becoming brighter. What could be causing this?

Many observers have noticed the existence and movement of bright spots all over Mercury's surface, including its polar regions. Could these bright areas be snow, or water-vapor bearing clouds or a combination of the above? Consider the following evidence.

Take a look at the photograph in Figure 4.5. This recent high resolution image was taken by the Swedish solar telescope at La Palma. It shows two bright spots on Mercury. Astronomers have interpreted these as "crater ray ejecta." Richard Baum casts a sceptical eye at that explanation. Here's why. In an article in the *Journal of the British Astronomical Association* he refers to the many sightings of white spots seen all over Mercury by observers of the highest integrity and none of these match up with the "crater ray ejecta" idea.

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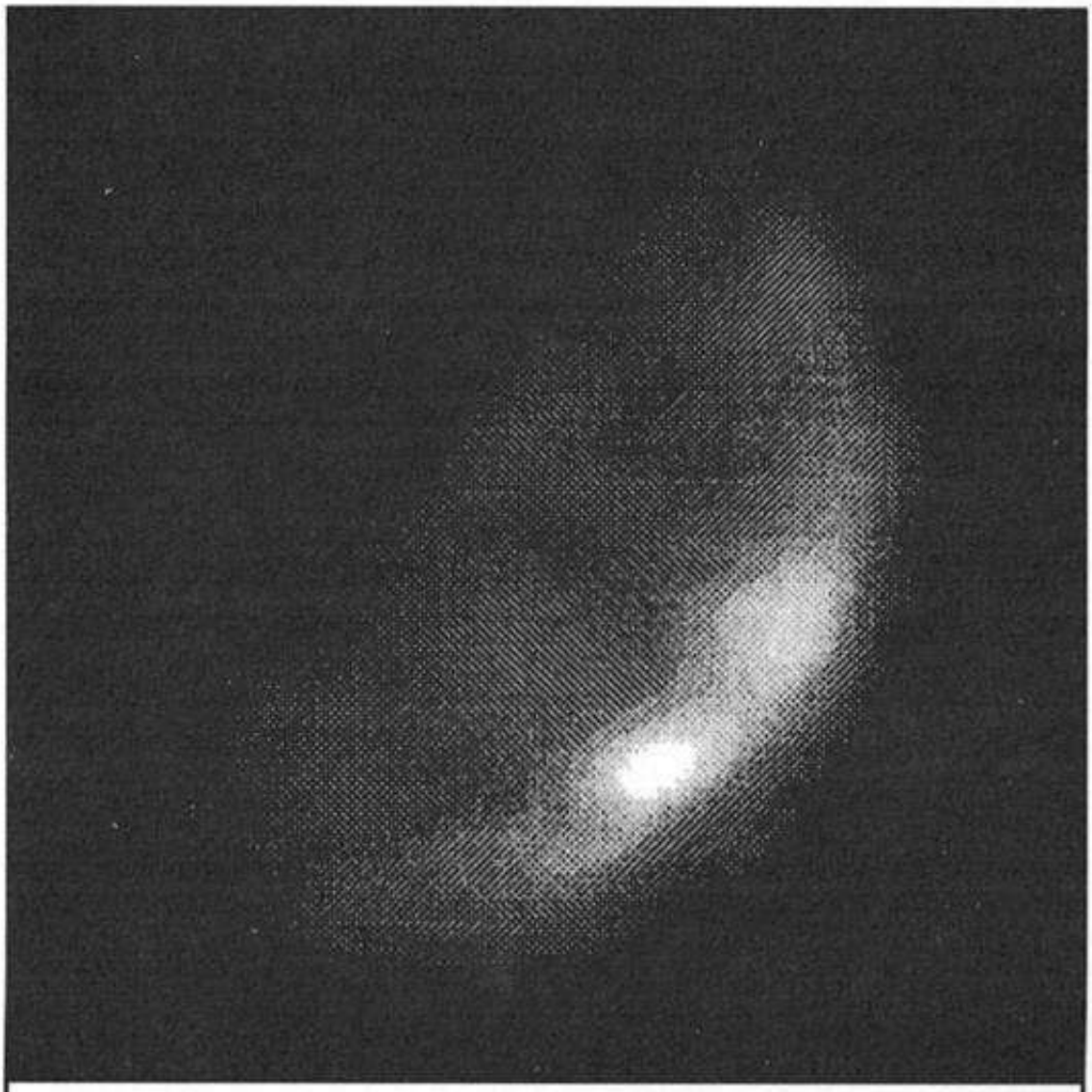

Figure 4.5
Mercury: 22nd October 1995. Photographed by Johan Warell using the Swedish Solar Telescope. Credit: Baum, Richard; "An observation of Mercury and its history," *Journal of The British Astronomical Association*, 107:38, 1997

He quotes the Rev. T. W. Webb regarding a sighting on 11th June 1867:

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"A bright spot with faint lines diverging from it, NE, and S., was seen. . . a little S. of the center, in unusually clear air. . ." Then on 13 Mar 1870, "Birmingham was pretty certain that there was a large white spot near E. limb". Webb mentions Vogel at Bothcamp had observed spots on 14 and 22 Apr 1871. W. F. Denning also saw spots on several days in November 1882:

> I observed Mercury at about the time of sunrise, employing a 10–inch reflector, power 212. **Dark patches and bright spots and veins were detected on 5 Nov**. . . Significantly, **'The planet showed a well-marked luminous area between the ENE part of the limb and terminator**. . . On 6 Nov. . . the appearance was very similar. . . 8 Nov. . . definition was excellent and the markings readily observed. The bright area seen on previous nights was still visible, and placed centrally within it appeared **a small brilliant point with luminous radiations**. Nov. 9. . . definition was again very good, and most of the features were redetected, though they were placed obviously to the eastwards of their positions on previous mornings, proving that the rotation-period is somewhat greater than 24 hrs. . . **the bright area was decidedly fainter**.

Since Mercury rotates so slowly, it is clear from his remarks that these spots had moved relative to the planet's surface.

H. McEwen described seeing "distinct, small brilliant patches, almost points" in 1895. P. B. Molesworth described the following on 3 Apr 1898: ". . . certain of the existence of a bright spot on South preceding limb." Two days later: "Bright spot seen on South preceding limb." Four days later at a magnification of 340: "Very bright spot on South preceding limb." In this case, the spot seemed to be growing brighter over a period of several days.

Denning had seen the same spot as Molesworth. He described it as: "White spot on north following limb was **very striking and semioval in outline**, **almost like snow cap on Mars**." On another occasion "Same spot on north following limb unchanged in place and **very bright**." Another sighting read: "Limb bright with two brighter patches near center." This particular patch remained visible from 23 May to 17 June. On 20 Sept he recorded: "Brilliant oval patch surrounded by faint shade mid-way between the northern cusp and center of limb."

On 8 June 1904, Mr. Lepper of Natal, South Africa, reported: "a bright

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spot. . . in the southern hemisphere about halfway from the equator to the pole and midway between the limb and terminator." Schiaparelli also saw spots on Mercury. His analysis of these spots in a paper written in 1889 is exceptionally insightful, and well worth pondering:

> . . . [These spots] often last for more than a day in a particular place [and] occur for the longest periods near the limb of the planet, where they sometimes become very splendid; but they are not rare even on the inner parts of the disk, only they are then less bright and harder to recognise.

Baum tells us that:

> He [Schiaparelli] thought them 'probably related' to the white veils, and suggested that together with the 'variable intensity of the dark spots, [they] are **due to more or less opaque condensations**, **produced in the atmosphere of Mercury**.

Denning did not believe that Mercury had a substantial atmosphere. Yet, he could not dispute Schiaparelli's observations. In fact, Denning corroborated them. He concluded that:

> Mercury. . . resembles Mars more than any other of the planets of the solar system. . . It has some spots which become partially obscured and sometimes completely so; **it also has some brilliant white spots in a variable position**.

Baum mentions that as recently as 1995, another astronomer, David Graham, wondered what was causing these spots.[28]

Mercury is exceptionally active for a small planet with no atmosphere where no refraction can be taking place. Baum's skepticism is understandable. The interpretation of the Swedish solar telescope results do not make sense in the light of a rich tradition of visual sightings which suggest that something else is happening on the planet. Baum rejects the current interpretation. Could it be that the Swedish solar telescope has managed to photograph clouds or ice deposits? Clearly craters do not move from one day to the next. If these bright spots were caused by craters then these craters would have been identified long ago. Indeed, they could have

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been used to establish the axial rotation of the planet. This never happened. These spots vary in latitude, and in brightness. They come and go. Some of the spots are moving (clouds?) but many are stationary (ice?).

Consider Denning's own comments wherein he likens some of the patches to the polar ice caps on Mars and wherein he describes Mercury as being very much like Mars. Shiaparelli's observations are even more stunning. He notes that the spots are often brightest on the limb. Could it be that some of these patches are actually snow-falls which are in the process of melting? Could these bright patches then become dark patches once the ice has melted and the water has wetted the soil? Schiaparelli definitely seems to think that this is moisture. He does not mention ice, but that is understandable given the tremendous heat on the outside of that planet. But he definitely links these patches to the "white veils" which he clearly considers to be clouds. And he obviously felt that Mercury had a substantial atmosphere which could not only sustain clouds but which also contained moisture. To this day nobody knows what to make of these bright patches on Mercury. But it seems to me that what we have are snow-falls, moisture on the ground and also moving clouds.

At the polar caps of Mercury things surely become more complicated. Let us concentrate on the polar brightening and darkening. Here we may have wind from inside the planet creating dust storms and depositing ice. And we may even have cloud emanating from inside the planet. I think many astronomers must have, unwittingly, been watching the deposition of ice in progress at the polar caps. The Wegner map, and the observations of other astronomers suggests to me that ice existed devoid of a dust layer for quite some time. This ice must therefore have fallen recently. I see no mechanism by which wind would have swept an old layer of dust off of the ice. The ice described in these accounts covers a large area. Any wind which sweeps dust off the ice could only have brought new dust with it. Such a wind would also raise a dust cloud. I cannot see wind as a mechanism which will expose the ice beneath the dust, even temporarily. When a dust storm is in progress the region will simply become darker. It follows that on the occasions when the Mercurian ice caps were bright that no dust storm was in progress. Moisture-laden air must simply have blown there, deposited ice, and come to an end. As the planet rotated, other winds caused the ice to be covered in dust. The ice then melted wherever direct sunlight fell.

The mere fact that Wegner was able to draw a map of Mercury and to

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show a bright region, akin to a polar ice cap, at the South Pole indicates that for quite a considerable period of time, the South Pole's ice was not covered by dust. During the decades before and after the Wegner map, Mercury's polar regions again returned to their normal dim selves. This indicates that at some point dust covered the ice. Back in 1923, new ice had fallen. It seems therefore that in past astronomical records one will uncover instance after instance when new snow-falls created an ice cap. Then there were periods when dust storms came to cover the ice and darken the region so that the entire cusp would disappear from view.

The idea of water-vapor being in the air coming out of Mercury must seem strange. It would indicate that the temperature inside Mercury is at least above freezing point. This air could of course freeze as it exits on to the outside of the planet. This depends of course on the exact location it is exiting from. Assuming that this exit point is not exactly at the South Pole, one would expect ice to only form when this point lies in darkness, in the extreme cold of the night or when this air blows towards the night side of the planet. It would be evaporated during the next Mercurian day (in several weeks time). Only the ice in polar crater floors would be able to survive for long periods of time.

The interior of a hollow Mercury would surely be exceptionally cold since it never receives direct sunlight. If air exits out of Mercury containing water vapor then this indicates the presence of a heat source inside Mercury. No matter how hot Mercury is on the day side, it is unlikely that this heat could filter through the thick crust to warm the interior. Hence Mercury must have an Inner source of heat. This Inner source of heat might well be the same thing that produces its magnetic field. Does this imply that Mercury has an inner Sun?

The appearance of ice at the Mercurian poles may seem as improbable as finding ice-cubes in hell. Very recently, Louis A. Frank from the University of Iowa has presented some controversial photographs which apparently show the Earth being pelted by house-sized ice-comets several times per day! Even if we apply Frank's scenario to Mercury, we still have to account for this ice becoming covered in dust over a period of time. This implies that air is exiting from inside Mercury quite often.

The observation from 1923 is interesting because here we see a very large, very bright area outside the blunt cusp. An area so large could never have been created by the simple pelting of house-sized ice-comets alone. The

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notes in older literature about the blunted cusp being surrounded by bright areas therefore implies that the blunted cusps are related to the ice in some way. It suggests to me that we first have moisture laden air exiting from Mercury, which deposits ice around the Polar Hole. Then, as the winds create a denser, temporary atmosphere in the vicinity, dust is stirred up which then causes the blunted cusp. Finally, the air seeps back into the planet through the hole, and through cracks in the crust. The dust now settles and the ice is covered in dust.

If it were not for the high day time temperatures on Mercury which cause the ice to melt as it rotates, then Mercury might have an appreciable ice cap! Kindly note that sometimes the brightest spots sometimes lie on the limb, facing the Sun. At first it might seem that Mercury is too hot for ice to last for a few weeks at a time. But, as will be shown, Mercury seems to cool down anomalously. This might then enable the ice to persist for a few weeks in direct sunlight.

None of the eminent astronomers of today, except for Richard Baum, would dare to suggest that astronomers of earlier times had indeed seen the deposition of a Mercurian ice cap in progress!

I asked Richard Baum about this anomalous brightening of the polar regions of Mercury. In his correspondence to me he stated that he feels this issue deserves greater publicity and more attention from astronomers. We will be meeting up with the very talented Mr. Baum again later. In an e-mail dated 3 May 1998 he commented as follows:

> **Several observers have remarked upon the brightening of the polar regions of Mercury**. **That is a fact**. **Whether it is due to some deposit or not has yet to be determined**. That frost caps on Mercury are possible was signified by V. A. Firsoff some years before he died. I did write a little piece about it for the *Journal of the British Astronomical Association*. . . The idea of watery comets depositing on the Moon for instance dates to Gruithuisen. It was he who first made that suggestion early in the 19th Century. I prefer to keep an open mind on these matters. **When Firsoff propounded ice caps on Mercury a distinguished specialist in atmospheric dynamics Garry Hunt laughed the idea out of the arena**. **Now who's laughing?**

Baum's "little piece" in the *Journal of the British Astronomical Association*

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is well worth reading:

> In 1991 radar astronomers cited anomalous reflections at high latitude regions of Mercury as evidence of subsurface polar ice caps. Considerable scepticism was invoked, but three years later new high-resolution radar maps left little room for doubt; many of the anomalies identify with high-latitude impact craters. According to theory, the permanently shadowed floors of such formations are the only places on the planet cold enough to trap water ice for long time intervals.

Baum then begins questioning the theory on the basis of historical astronomical observations:

> **Whether this is actually the case has yet to be decided**, although more recent studies raise the possibility of other substances like elemental sulphur.
>
> **Strangely**, **drawings of the planet by the French observer G**. **Fournier in 1907 and 1920**, **and by Walter H**. **Haas in 1963 each show a white spot at the North Pole of the planet**. **Polar brightening was also apparent to Bestwick**, **Moore and others in the 1960s**. **However the configuration is not regularly visible**. It is thus interesting to report brightness at the north cusp was conspicuous to R. W. Middleton, Brightlingsea, on two separate occasions during the favorable evening elongation of April this year. . . Polar brightening again showed on 28 Apr. . . It was not so obvious and seemed less extensive;. . . It is relevant to note that Mrs. S. Beaumont observing from Windsmere, 17 April. . . was able to report 'The north area seemed slightly brighter than the rest of the disk.'

Note Baum's cryptic closing thoughts:

> **Obvious correspondence with the radar data is not implied**, but it is the greatest interest for the visual observer to appreciate that Mercury is not quite so intractable an object as the textbooks say. Patience and perseverance can be highly rewarding.[29]
>
> He politely denies any correspondence with the radar data, but it is clear

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that the entire thrust of his article is strongly hinting at a polar ice cap on Mercury which comes and goes and has been mapped many times. It has been seen by people of the caliber of Moore and Haas. Baum is definitely thinking this is ice, even though he politely denies it! He is calling into question some of the statements in those textbooks. Naughty Mr. Baum!

In his article he cited astronomers who each reported anomalous brightening of the Mercurian polar caps. He obviously can't help wondering if it is ice, even though that would be a major challenge to those professional scientists and their theories. Can you blame him? In all reasonableness, one just cannot ignore the history of polar brightening on Mercury. Its correspondence with the radar data is obvious. Something is happening on an enormous scale on Mercury and for some unknown reason, professional scientists just have not come round to noticing or acknowledging it. Baum sent me some more information regarding the western elongation of Mercury in October 1996.

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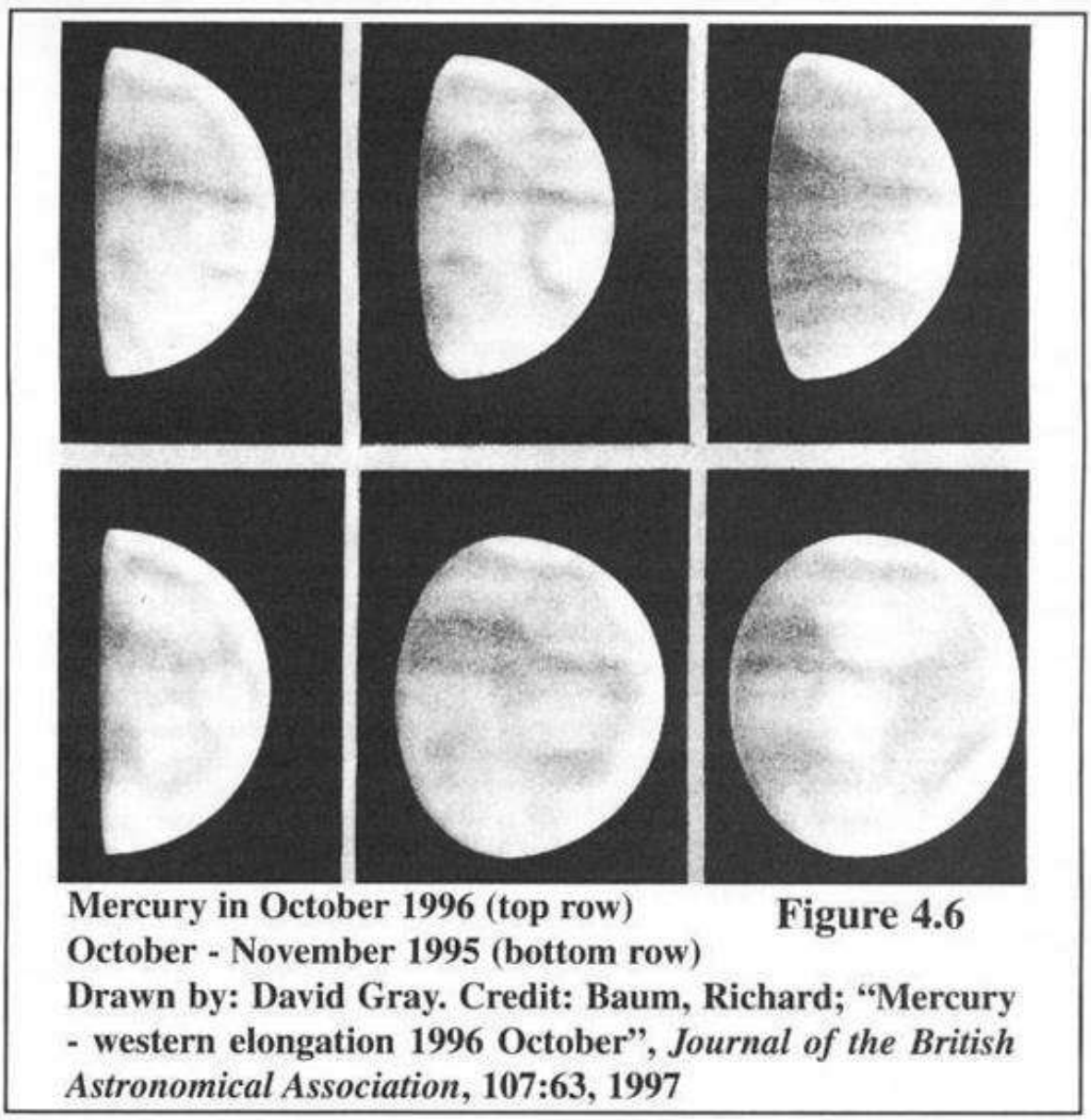

Mercury in October 1996 (top row)
October - November 1995 (bottom row)
Drawn by: David Gray. Credit: Baum, Richard; "Mercury - western elongation 1996 October", *Journal of the British Astronomical Association*, 107:63, 1997

Figure 4.6

While looking at Figure 4.6, I noticed that the polar regions seemed to be much brighter than the equator and that there seemed to be an ice cap. I had not read Baum's accompanying article, so I was unaware that he had already mentioned the possibility of ice caps on Mercury. I immediately sent an e-mail to him to ask if I was correct in assuming that the polar caps were brighter. His answer:

> You are right in assuming the south polar cap in the 1996 Mercury drawings is brighter than the tropical regions. Radar data is suggestive of ice caps. **One cannot therefore rule out the possibility of a possible**

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visual sighting.

When I read Baum's article in the *Journal of the British Astronomical Association* it mentioned the following: "Mrs. S. Beaumont (Windermere). . . notes: '**Both cusps seemed equally bright** . . .'" Baum made some interesting comments of his own:

> The elusive planet of twighlight (sic) may be difficult and frugal in its offerings, but it also has the ability to surprise. **Polar ice caps may by speculative**, **but the possibility is posed**. **So it is with David Gray's excellent drawings**. They uphold the traditions of the past while reminding us of the opportunities still available to skilled observers.

The constant changes in the Mercurian polar regions clearly indicate that something enormous is happening there. At one moment the entire polar region disappears and cannot be viewed (blunted cusps) and at other times these regions become exceptionally bright. This seems to have been ignored by professional astronomers. I detect an undertone of rebelliousness in Baum's writings because these are clear violations of theory. Baum is the Director of the Mercury and Venus sections of the British Astronomical Association and he no doubt has constant access to reports from astronomers in England and elsewhere. Undoubtedly he has noticed that something here is not right and Mercury is not conforming to theory. He and others have politely stood back and let the professional astronomers take credit for the ice at Mercury's poles, but they have realized that this ice is not always hidden under the dust. They are able to see this ice. Mercury is indeed dynamic. Massive changes are taking place there. Perhaps it is time someone just stood up and challenged all this theory for once and for all.

THE RING AND THE SPOT

Mercury sometimes passes directly between the Earth and the Sun. This is known as a transit. These transits are to be observed only in May and November. As Mercury creeps across the Sun's face, it is usually a vivid black, but on occasion a bright spot appears just south of the planet's center. A halo of bright light around the black disk is sometimes seen too. The halo may accompany the bright spot, but not always, and vice versa. Astronomers in the past theorized that this ring was caused by the presence of an

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atmosphere around Mercury.

One, rarely two, small bright points of light are seen on the black disk of Mercury as it transits the Sun. Sometimes, the spot appears greyish. It is rarely centered, being mostly south of the center of the disk. The spot(s) do not appear at every transit. Mercury's bright spot has been observed many times by many different astronomers utilizing various telescopes. The abundance and consistency of these reports , coupled with multiple observers and instruments , argue against optical illusions and instrumental aberrations.

Figure 4.7 is a drawing of the appearance of the spot as Mercury passes in front of the Sun. I raised the issue of the white spot with Richard M. Baum. On 30 July 1996 he wrote to me in part:

> The white spot **often reported at the center of the tiny black disk** of the planet during its transits across the Sun has been variously described and almost certainly is to be classified with illusory appearances.

In 1878, on page 392 of Vol. 38 of *Scientific American*, there was an article with the strange title: *Is there a Hole through Mercury?*

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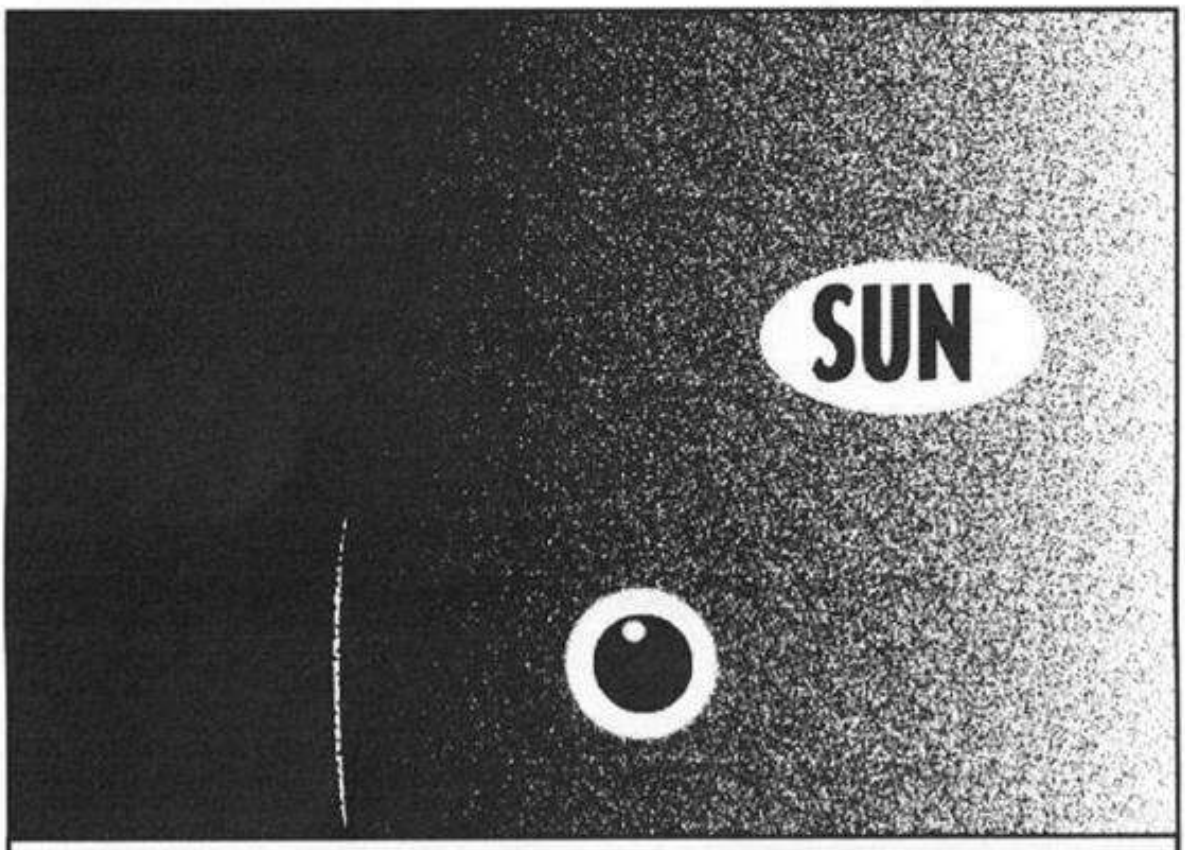

Figure 4.7 Mercury's White Spot
Reproduced by permission of the Royal Astronomical Society

It seems this bright spot had caught the attention of astronomers of that time and the idea had been suggested that there is a hole which goes right through Mercury. This hole is only visible when Mercury is in the process of transiting across the Sun. With the Sun behind it, one would then be able to see this bright spot—which would be the result of the Sun shining directly through the planet. The writer of the above article in *Scientific American* observed this spot along with his daughter. He noticed that the spot faded when a cloud passed across the face of the Sun. He therefore concluded that the spot was an optical effect.

My own investigations into the spot are inconclusive. There are many accounts of this spot and how it moves. The spot is not always there when Mercury transits. As Baum mentions, the spot is most often reported in the

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center of Mercury, but not always. That the spot appears, disappears and moves argues in some ways against it being an optical illusion. My attempts at correlating the spot with a physical feature (based on the planet's period of rotation being 58.6 days) have been unsuccessful.

The possibility may exist that one is not seeing the Sun, but perhaps the Inner Sun of Mercury. All that is needed is for an astronomer to turn a spectroscope to Mercury during one of its transits, and to then analyze the light which comes from this spot. That would at least tell us if the light from that spot comes from our Sun or not.

At this time, with my own enquiries being inconclusive, I thought I would mention it in passing. Perhaps new information in the future would shed light on what this spot really is. Is it really an optical illusion?

The ring around Mercury also should not be appearing. It too is regarded as an optical illusion, yet it may not be. The supporting evidence I have presented here strongly suggests that Mercury does indeed have a temporary atmosphere. In that case, a ring around the planet is to be expected. The ring is merely the result of the Sun's light passing through the atmosphere. B. G. Jenkins wrote:

> Let us turn to the rings which have been observed round the planet during a transit. In May 1707 the late Assistant of the then Astronomer Royal saw Mercury in transit encompassed by a thick haze or atmosphere.
>
> In the transit of May 1753 a ring was observed round the planet; also in that of May 1786. In May 1799 a dark or nebulous ring was observed, the tinge being of a violet hue and strongest near the planet. Schroter also saw the ring, the light of which he says was scarcely brighter than the surface of the Sun, but of another color. Harding did not see it at first, but he did afterwards when he used a lighter shade.
>
> In May 1832 the planet was seen at the Royal Observatory surrounded by a dusky tinge. In this transit also the ring has been described as of 'a violet hue, the color being strongest near the planet.'
>
> This is the sum of our knowledge about the rings round the planet in the May transits, and from it the natural inference appears to be that when the planet is in transit near its furthest distance from the Sun, it is

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generally surrounded by a dark nebulous ring.

The first November transit in which we have mention of a ring is that of 1736. Professor Moll says Plantade saw the reverse of what he saw in May 1832; so that the ring must have been a bright one.

In 1789 and 1802 rings, probably bright ones, were observed. The transit of 1835 was not visible in Europe; that of 1848 was, however, and many observers saw a bright ring, although Mr. Breen says he did not see any.

In November 1868 Mr. Huggins saw the planet in transit surrounded by an aureola of light, a little brighter than that of the Sun’s disk.

Here the weight of evidence appears to be in favor of a bright ring round the planet when near the Sun, which would probably be the case. It should be stated, however, that Prosperin calls the ring of May 1786 a luminous one, and Ljungberg that of November 1802 a dark one; but it must be remembered that the ring of the transit in 1799, which there can be no doubt was dark, nebulous, and of a violet hue, is described by Schroter as scarcely brighter than the surface of the Sun, and of another color.

Collecting these results and comparing them, it will, I believe, be found:

1st. That in the May transits, when Mercury is near its aphelion, the luminous spot is in advance of the planet, preceding the center; in the November transits, when Mercury is near its perihelion, the luminous spot follows the planet.

2nd. The luminous spot has never been seen at the center, but always south of it, and therefore cannot be due to diffraction, as Professor Powell suggests.

3rd. Sometimes in the same transit two spots have been seen close together, where shortly before only one was observed.

4th. In the May transits the rings round the planet were dark or nebulous and of a violet tinge; in the November transits they were bright.

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> 5th. If we take the two transits which have received the most careful observation, the May transit in 1832, observed by Professor Moll, and the November transit in 1868 observed by Dr. Huggins we find the contrast very great and very typical: in the one case a diffused spot preceding the center, with dark ring surrounding the planet, in the other a sharply defined spot following the center, with bright ring surrounding the planet."
>
> 6th. From all which I conclude that on May 6 next, when Mercury will be at almost its furthest distance from the Sun, the luminous spot will not be a point of light having no sensible diameter, but rather diffused, with a periphery not well defined, gradually sinking from a greyish-white to the dark color of the disk, situated a little in advance of the center and to the south of it, and that the planet will be surrounded by a dark nebulous ring, not a bright one.[30]

The spot did appear during transit of 6 May 1878 as Jenkins predicted. The result was the article in *Scientific American* which resulted in that author determining that the spot was an optical illusion. I am not sure whether the spot really is an optical illusion, but it is a most fascinating phenomenon which perhaps warrants some more study.

During the last century astronomers debated whether Mercury had an atmosphere or not. The general consensus was that it did not. Yet, sightings of a ring during transit continued. This ring around Mercury was the same as the ring seen around Venus during its transits. The only problem is that Venus has a dense atmosphere while Mercury supposedly has none. So how can Mercury then have a ring around it? In 1896 Brenner wrote:

> Observing Mercury on the 18 May, between 2200 and 2300 GMT. I was astonished to see not only spots. . . but even the dark side surrounded by an aureole, just like the appearance of Venus in July 1895. Fearing to be the victim of an optical illusion I tried various eye pieces [powers 146, 196, 242, 310, 410], changed the position of the planet in the field and shook the telescope, but both phenomena remained unchanged (respectively dancing with the illuminated disk in the same manner), so that there remained no doubt. Besides, after having made the drawing (at 2230) I called Mrs. Manora, **who believed for the first moment that it**

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> **was Venus**, **as the appearance was so similar**. **She pronounced the dark side and the aureole to be very conspicuous objects**, saying that she saw them at the first look whilst she saw the spots on the illuminated disk later. . . It seems strange that nobody else has made a similar observation up to date.[31]

Since this was seen by two different observers, and they went to great extremes to ensure that it was not due to faulty equipment—we can therefore rule out the theories regarding optical illusions, psychological effects, etc.

TEMPORARY ATMOSPHERES

Mercury is heavily cratered and has virtually no permanent atmosphere, yet, astronomers have noted many elusive "markings" upon its surface. In 1927, the famed planetary astronomer E. M. Antoniadi completed a long series of Mercury observations, particularly regarding the motion of the markings. His conclusion: Mercury definitely has a rotation period of 88 days, thus confirming the results of many other astronomers. This "fact" was accepted by astronomers until 1965. This is now thought to be wrong. Even the best astronomers have had their problems with Mercury's elusive markings. Were these astronomers perhaps observing atmospheric phenomenon which mislead them? Mercury's atmosphere is very thin, but the possibility exists that these elusive markings may the result of atmospheric flow into and out of this planet.

It is surprising to find the possibility of a "polar ice cap" on a planet with surface temperatures of 800° F. The "ice" is accounted for by cold temperatures in the areas away from the direct sunshine. No scientist ever predicted this. What is of interest is the existence of water vapor in the polar regions. Where does it come from? And if the ice caps were shrouded by dust on previous occasions, then where did the dust come from? Are there winds blowing from inside Mercury? That the blunted cusps are in the polar regions is highly suggestive of Polar Holes which may lead deep into the heart of the planet. This would explain why the blunted cusps occur so often, and why the variable markings on the rest of the surface may be related to the winds which may blow from inside the planet.

It is the elusive nature of these phenomenon which befuddle astronomers and which make them doubt their eyes, and their own sanity.

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They expect to find permanent atmospheres. The idea of atmospheres flowing into and out of whole planets must seem utterly absurd at first glance.

The appearance and disappearance of a ring around Mercury suggests that its atmosphere comes and goes. Patrick Moore mentioned that during transits Mercury shows no indication of an atmosphere. But there are others who have seen this ring around Mercury. Its similarity to the ring seen around Venus strongly suggests that the Mercurian atmosphere can become quite dense—perhaps dense enough to carry dust like the thin Martian atmosphere does.

The temporary nature of the Mercurian atmosphere probably accounts for the fact that there is no appreciable erosion of the craters on its outer surface. A further factor to consider is that according to current scientific theory, most of the Mercurian craters are of volcanic origin. This means that there must be tunnels going deep into the planet's interior. I would suspect that some of the atmosphere exits and also seeps back into the planet's interior by this route.

AIR CONDITIONING ON MERCURY

Textbooks state that the temperature of Mercury varies from a minimum -170° C (103° K) on its night-side to 430° C (703° K) at perihelion (closest approach to the Sun) on its day side. Scientists often compare Mercury and the Moon and have good reason to expect them to behave similarly. Calculations had shown that if the Moon were placed at the same distance from the Sun as Mercury then its average temperature would be 350° K (77° C). This would vary by 200° K as it orbits the Sun.

During the inferior conjunction of Mercury in April 1965, scientists studied its temperature using radar. At a wavelength of 3.4 mm the dark-side brightness temperature was found to be approximately 220° K (-53° C). The scientists also recorded the brightness temperatures at 8 mm. The results led them to believe that there would be a great variation in the 3 mm emissions of Mercury as it changes phase. This was based on the assumption that Mercury's surface layers behave similarly to the Moon. Earlier in this chapter we saw how Dale Cruikshank had made a similar assumption.

From 16 July to 17 Oct 1965 the scientists once again studied Mercury's temperature at 3.4 mm. To their amazement they found that even though their observations covered an almost complete revolution of Mercury, there was no

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significant temperature variation with phase and that Mercury was abnormally cool. Eugene Epstein, one of the scientists involved in the study, wrote:

> The most significant features are the brightness temperature of only approx. 200° K that was recorded when major fractions of the illuminated hemisphere were visible and the apparent absence of any strong variation with phase. **Both features were completely unexpected**.

Another very strange result was that when Mercury was near inferior conjunction and its brightness temperatures should have been low, the opposite in fact happened. Suddenly on 5 Aug and 20 Aug temperatures of 500° K (227° C) were suddenly recorded.

Epstein tried to determine if other factors could have caused the anomalous results for those two days but he could find none. He checked to see if the Sun could have caused these enhancements of the signals but could find no evidence of that. Another possibility was that perhaps the emissivity of the Mercurian surface varied inversely with physical temperature. He discounted this theory because it conflicted with the actual results he got at longer wavelengths. He discounted the possibility that droplets of molten iron 3 mm in diameter might be the cause. Epstein could find no explanation for these strange results.

At the same time he had also studied other planets with the same equipment and had experienced no problems. He explained:

> However, observations of Jupiter and Venus, made with the same procedures and on the same days as many of the Mercury observations, tend to disprove this explanation [of the possible cause of the anomalous results]. The Venus and Jupiter brightness temperatures are internally consistent and are in good agreement with the findings of many other observers, thereby indicating absence of any large systematic errors in my equipment and observational procedures.[32]

When one examines Epstein’s graph which shows the phase of Mercury versus the measured temperatures then a number of anomalous incidents become apparent. At times when the illuminated portion was small the temperatures suddenly jumped from the 200°–300° K range up to 500° K.

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And at times when the illuminated portion was large the temperature rose and fell strangely. For example, early in September the temperature is recorded as 150° K. Later in September it jumps to 400° K. Early in October it falls down to about 70° K and then within a week it rises to about 230° K. The September and October incidents took place when the phase was between 0.8 and 1.0 (1.0 = fully illuminated). During this period the temperature should be rising steadily but it did not. I wonder whether this could be caused by the presence of cold winds and ice from the interior and their disappearance later which then allows the planet to start heating up again?

It seems logical that a Mercurian inner atmosphere, being shielded from the Sun, might be cooler than the outer surface. And if the inner atmosphere is from time to time excited by an inner Sun it might flow out on to the surface for a time. We should then find that these winds will absorb some of the enormous outer heat and help to cool down the sunlit side of Mercury. This might explain why Mercury was so much cooler than it should have been for the period under observation. At other times, when there is no exchange of air between the inner and outer surfaces, the outer surface would heat up rapidly.

Could water-laden winds blow from inside Mercury out through some Polar Holes, the largest of which may be at its South Pole? These winds might deposit ice on the cold, dark side of Mercury, while cooling down the hot, day side of Mercury. The ice is deposited around the polar caps and even further afield. As Mercury rotates, the ice then melts. The ice which falls in craters and depressions which are not warmed by the Sun, is then later covered by dust blown by the cold winds from inside Mercury. The winds of Mercury seem to be relatively periodic and could do with more study. Perhaps the polar regions of Mercury should be constantly watched using radar. Such studies would show whether the winds of Mercury originate from inside the planet. One could not attribute the mass deposition of ice around its polar caps to ice comets. This is especially true if this deposition is cyclical and frequent. If such is the case, it can only originate from inside the planet. It would then demonstrate that not only does that planet have a substantial atmosphere inside it, but that it has water vapor. For water vapor to exist in air coming out of the inside of the planet there must therefore be a source of heat which prevents the water from turning to ice inside the cool, dark depths of that planet. Does that planet have an Inner Sun? If that planet has some kind of atmosphere, and water vapor, and some heating mechanism inside,

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one can only wonder if perhaps some kind of life may exist inside that planet? The answers to all these questions may be found if we can find out more about the Cold Winds of Mercury.

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Chapter 5: Leminous Venus

Venus is the second planet from the Sun. It has often been referred to as Earth's sister planet. With a diameter of 7,700 mi, Venus is very slightly smaller than the Earth. It has always been known that Venus is much hotter than the Earth. There were some scientists who once proposed that it was a hot, cloud enshrouded, tropical jungle which might harbour dinosaurs!

Venus has been visited by more space probes than any other planet in the solar system. Between the Americans and the Russians this planet has been visited by 20 probes so far, most of them Russian. In spite of this, Venus refuses to give up its secrets easily. Mapping the Venusian surface has been extremely difficult because normal telescopes cannot see through the thick cloud cover.

Long before satellites ever went there, spectrographs showed that Venus was extremely hot. Too hot for life of any kind. When the Russian Venera probes landed there they were amazed at the extreme pressure and heat of this planet. The probe itself only continued to function for a short while before being overcome by the heat.

Those first Venera photographs dashed the hopes of any who thought there might still be something of interest on that planet. It became patently obvious that no life could exist under these temperatures and pressures. So those who sought life in the solar system then embraced Mars as the only remaining hope.

Since then we have found life living deep in the oceans at the mouths of volcanic vents, in temperatures and conditions we never before believed could harbor life. Could there be primitive life on Venus?

Beyond that, will Venus ever present us with any surprises? Scientists doubt that very much. But wait. . . Perhaps the final chapter in the story of Venus has yet to be written. . .

THE MISSING OCEANS OF VENUS

Venus and Earth are similar in size and position in the solar system. They supposedly formed from much the same primordial materials. Venus "should" have almost as much water as the Earth does.

Let me pose a hypothetical scenario. What if water once upon a time

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flowed on the surface of Venus? What if Venus was cooler? What if, deep inside Venus, a nuclear reaction began which was to expand the planet and change its surface forever? Perhaps enormous earthquakes rocked the planet, and lava poured on to its surface in enormous quantities. Maybe this lava then destroyed river courses, and entire oceans of water evaporated? Perhaps this lava, and the accompanying earthquakes destroyed much of what had existed before? Beatty, writing in *Sky and Telescope* comments:

> Where has all of Venus' water gone? Theorists have asked this question for years. It doesn't make sense to them that a planet so like the Earth in size and distance from the Sun should have 10,000 to 100,000 times less water. After all, the pair have comparable amounts of carbon dioxide and nitrogen, **so the water was probably there at the outset but has somehow disappeared over geologic time**.[1]

Where did the water go? R. O. Fimmel writes in a NASA document:

> Unfortunately, measuring accurately the amount of water vapor in an atmosphere is very difficult. Even in connection with the Earth there persists much uncertainty about the amount of water vapor in the stratosphere. After the Venus mission of 1979 a similar state of confusion has developed concerning the amount of water vapor in the atmosphere of Venus. The neutral mass spectrometer of the large probe gave data that says there is less than 0.1% water in the atmosphere. A special optical device on the Venera probes found a small amount, too." (p. 147)
>
> It is entirely unclear why there is so little water in the Venusian atmosphere. Has Venus formed without water? **Is water hidden in the crust**, **or was it lost during the planet's evolution? Why is the vertical profile of water vapor concentration so extraordinary?** (p. 187)[2]
>
> The deuterium-hydrogen abundance ratio in the Venus atmosphere was measured while the inlets to the Pioneer Venus large probe mass spectrometer were coated with sulfuric acid from Venus' clouds. . . The hundredfold enrichment of deuterium means that at **least 0.3 percent of a terrestrial ocean was outgassed on Venus**, **but is consistent with a**

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> **much greater production**.[3]

The evidence above suggests that Venus should have a lot of water. Some scientists believe that the photodisassociation of water molecules and the resultant escape of hydrogen into space is the reason why Venus has no more water. But is the water really gone? Or is it now below the surface?

Analyses of the Venusian atmosphere led C. A. Wood and D. Amsbury to suggest in 1986 that:

> The discovery of a surprisingly high deuterium/hydrogen ratio on Venus immediately led to the speculation that **Venus may have once had a volume of surface water comparable to that of the terrestrial oceans**.

They suggested that various terrain features seen in the Venera 15 and 16 radar images might be salt deposits which have remained after the Venusian oceans had evaporated.

They compared this with models dealing with the total evaporation of Earthly oceans and suggest that the Venusian evaporite deposits should be at least tens to hundreds of metres thick. They state that: “From photogeologic evidence and insitu chemical analyses, **it appears that the salt plains were later buried by lava flows**.” Salt diapirism on Earth results in the formation of elongated salt intrusions, salt domes and other features which range from 1 km up to 100 km in size. Surface evaporite landforms are easily eroded away by water. Here on Earth they are only common in dry regions (e.g. Zagros Mountains of Iran).

They pointed to the existence of a variety of circular land forms on Venus which are from tens to hundreds of kilometers in width. These could be salt intrusions in impact craters or megasalt domes.[4, 5]

It would appear from the above that Venus did once have oceans of water. Venus must have been cooler in the past, perhaps before its Inner Sun got started? The planet might have condensed, cooled down and formed a solid planet. Then as things began settling down, and the inner nuclear reaction got going, the Inner Sun caused lava to flow onto the outer surface of the planet, to evaporate the oceans of water and bury the salt. The water vapor might well have ended up inside Venus once things had cooled down inside, and much of the atmosphere was sucked inside, leaving mostly carbon dioxide on the outside. Most of the heat from the Inner Sun’s start-up would

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have reached the outer surface of the planet in the form of lava and hot gases.

When the NASA Magellan probe photographed the Venusian surface, the scientists discovered a very long and thin channel which they nicknamed "the River Styx." It is one of the most bizarre features yet found on Venus and its existence is difficult to explain. Styx is 9,800 mi long and only half a mile wide. Scientists are not sure what could have carved this channel. Because of the very high temperatures on Venus, scientists have suggested a number of exotic fluids including sulphur which might have created this channel. Andrew Chaikin, writing in *Discover* comments: "Water, of course, is out of the question. Flowing lava is a possibility, but it would have to have been extremely hot, thin, and fluid." The River Styx also does not run steadily downhill. Its course undulates. Chaikin comments:

> Either the Venusian topography has shifted since the Styx was cut, or the channel is not a river at all but rather some bizarre geological feature.[6]

The above would be consistent with the idea that the River Styx was a real river once upon a time. Since its current topography no longer runs steadily downhill, it would seem to have been changed by some kind of planetary upheaval. Similar features may be found on our Moon. Was the River Styx destroyed by the ignition of a nuclear furnace deep inside the planet?

The idea of water seems so utterly preposterous that it is dismissed out of hand by Chaikin. A nuclear reaction could easily deform Venus's surface during a "boiler-start-up-phase". What if Venus was turned into a giant pressure cooker which caused some land to rise as volcanoes burst to the surface? The subsequent quakes and lava would then destroy all the oceans and rivers on the planet's surface. What if this nuclear boiler exploded and created planetary Polar Holes? What if the evaporated oceans and its current atmosphere was sucked inside when the planet cooled down?

In the 16 November issue of *Science*, R. A. Kerr remarks:

> The planetary geologists who are studying the radar images streaming back from Magellan (the space probe) find that they have an enigma on their hands. When they read the geological clock that tells them how old the Venusian surface is, they find a planet on the brink of adolescence.

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But when they look at the surface itself, they see a new-born babe.[7]

Of the craters mapped by Magellan, very few show any signs of aging (i.e. tectonic movements, lava-filling, etc.) The surface of Venus should be hundreds of millions of years old, yet it looks freshly minted. The anticipated spectrum of degradation has not yet been seen.

One theory is that recent lava flooding erased the old craters, and we now see only recent impact scars. One of the questions raised by this is: Why would a planet's volcanism be turned off so abruptly? But what if the volcanism was caused by the expansion of the planet by nuclear forces? Perhaps the volcanism subsided once holes were blown in the poles and the pressure inside suddenly dropped? Photographs taken by the Soviet Venera 13 and 14 space probes have led to suggestions that:

> The rocky debris surrounding the
> shows, to nearly everyone's surprise, strong evidence of sedimentary, layered structure. The rock formations display ripple marks, thin layering, differential erosion, and even hints of cross-bedding.

The vision of ancient seas on Venus leaps to the mind; but according to Russian scientists it is far more likely that the sediments were created by winds, episodic volcanism, or repeated meteor strikes."[8]

It seems to me as if there is some pretty strong evidence which shows that Venus did indeed once have water in oceans and rivers. But then something catastrophic happened which changed all that.

Venus is formed in the same region of the solar system as the Earth. Presumably it was formed from the same materials as the Earth. It is almost exactly the same size as the Earth. If Venus had water, should it not also have oxygen?

THE PLANETARY GREENHOUSE

Why is Venus so hot? At first the answer would seem simple: the planet is closer to the Sun, and the Greenhouse effect of the gases in its atmosphere has caused it to retain the heat it gets from the Sun, thus causing it to become hotter and hotter. G. Israel writes:

> The northern hemisphere of the planet has a radiation temperature,

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integrated over all wavelengths, of 230° K. This corresponds to an energy output into space of 158 W/m^2.

At the level of the Venus orbit, the electromagnetic energy received from the Sun is 2621 watts/m^2, which corresponds to nearly double that reaching the top of the terrestrial atmosphere. Nearly 80% of this energy is sent back to space by the Venusian atmosphere and by the clouds, due to the high albedo (0.77). The solar energy absorbed by the planet is only 150 W/m^2 (as opposed to the 240 W/m^2 absorbed by the Earth). More than 70% of the available energy is absorbed by the clouds and by the upper atmosphere above 68 km. The remaining energy is absorbed equally by the lower atmosphere and by the surface of the planet. **The thermal energy which reaches the surface of Venus from the interior is estimated to be 0.06 W/m^2. . . consequently the very high temperature at the surface is due only to solar energy (which is roughly 20 W/m^2). How can one understand the surface temperature of 735° K, which was first estimated and later confirmed thanks to the series of Soviet Venera landing probes?**[9]

Note how little heat supposedly reaches the Venusian surface from its interior. Note too that the Earth receives 240 W/m^2 on its surface, while Venus receives only 20 watts/m^2 on its surface. Yet, the surface of Venus has a temperature of 460° C which is hotter than the surface of Mercury in direct sunlight. The explanation supplied by G. Israel above, is that a runaway Greenhouse effect is to blame. Later on the same page G. Israel remarks: **“**. . . **a crucial event during the evolution of Venus** has produced a fundamental modification of the properties of the atmosphere. . .” He cites water vapor as the major ingredient. He writes: “at some point in time the lower atmospheric layers reached a critical temperature above which water was present in a vapor state. The greenhouse effect became irreversible as almost all the water and all the carbon dioxide locked in the planet were now back in the atmosphere.” He goes on to speculate that an amount of water equal to the Earth’s oceans (1.39 x 10^{21} kg) was transformed into water vapor.

The above excerpt parallels many of the ideas I expressed earlier in this chapter. Where I differ with Mr Israel is that (a) The crucial event might have been triggered, not by the Sun, but by an event inside the planet. (b) The amount of heat reaching Venus from inside the planet may be a lot more than

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0.06 W/m^2.

Not all scientists think that the Greenhouse effect alone can account for the high Venusian temperatures. Here is what R. Kerr has to say:

> Perhaps the most perplexing of the atmospheric problems lingering after Pioneer is the 460° C temperature **at the bottom of the atmosphere. The much ballyhooed Greenhouse effect of Venus's CO_2 atmosphere can account for only part of the heating**. . .

But what happens to the Sun's energy once it has penetrated through the highest clouds asks Kerr? He points out that the evidence for other heating mechanisms is uncertain. Kerr continues:

> When Pioneer Venus's probes looked at the amount of radiant energy passing through the atmosphere, each one found more energy being radiated up from the lower atmosphere than enters it as sunlight.[10]

Working with data from the Pioneer Venus Orbiter, F. W. Taylor found

> . . .that Venus radiates 15 per cent more energy than it receives. To keep the surface temperature constant, Venus must be producing this extra heat from within. All the inner planets, including the Earth produce internal heat from radioactive elements in their rocks. But Taylor's observations of Venus would mean that the planet is producing almost 10,000 times more heat than the Earth, and it is inconceivable, according to present theories of planetary formation, that Venus should have thousands of times more of the radioactive elements than the Earth does. At last week's meeting, Taylor's suggestion met with skepticism, not to say sheer disbelief, from other planetary scientists.[11]

Venus is generating far more heat than it should. Note too, that this is estimated to be some 10,000 times more heat than the Earth. This might not necessarily require 10,000 times more radioactive elements. It might merely mean it has an Inner Sun which is more active than the one inside the Earth, and that Venus is better able to retain its heat.

Did Venus expand recently in geological terms? Would this be why it is giving off more heat than it is receiving from the Sun? Would this explain why it is so hot? Or did this heat gradually build-up over many millions of

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years?

The Reader should be aware from above that heat is being generated from inside Venus, that there is excess heat at the bottom of the atmosphere. The source of this heat is a mystery. Clearly it is of internal origin and has nothing to do with the Sun, or the Greenhouse effect. The “standard” scientific explanation that the Greenhouse effect is due to our Sun giving out more energy, does not account for:

1. The deformation of the River Styx.
2. The lava which poured out on to the surface and covered all existing terrain features, thereby creating the “pristine” surface. Nor does it explain how this phenomenon started suddenly, and ended just as suddenly.
3. It does not account for the current excess heat being generated inside Venus.

In summary, scientific theory dictates that Venus “should” have had entire oceans of water, once upon a time—comparable to the oceans of Earth. There are various terrain features depicted in the Venera 15 and 16 photographs which may be residual salt deposits. The photographic evidence from Venera 13 and 14 images seem to show the existence of sedimentary rocks, with ripple marks. Then, there is the mysterious “River Styx” which is 9,800 mi long and only half a mile wide, and which must have been carved by a fluid more viscous than lava. It would seem reasonable to suppose this liquid was water. If water existed on Venus in a fluid form, then the planet must have been cooler at that time.

Did the water vapor of entire evaporated oceans help to fuel a runaway Greenhouse effect? It is doubtful that the Greenhouse effect alone is the cause of these extremely high temperatures. The mechanism which transformed Venus is probably the same one which is still producing the 15% excess heat. Is this mechanism still at work creating other natural marvels?

ANNULAR PHASE OF VENUS

In order to appreciate some of the amazing things which take place on Venus, let us examine some of the characteristics of its atmosphere.

The atmospheric pressure at ground level is between 92 to 95 times that

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of the Earth. There are also clouds at altitudes of 48 and 68 km. These clouds have a particle density comparable to thick mist observed at the surface of the Earth. Scientists have long suspected that its atmosphere is highly refractive (i.e. its ability to bend light is considerable). They expect this because of its tremendous atmospheric pressure. On Earth we have a similar effect in the polar regions. The extremely cold air causes light to perform numerous tricks. But on Venus the effects are far greater. In this section we will take a look at how light from the Sun bends right around the planet in all directions. Once the Reader understands this effect many other phenomenon on Venus will begin to make a lot more sense.

Astronomers have long been aware of how highly refractive the Venusian atmosphere is. They deduced this from the rather rare transits of Venus. Many astronomers noted that as Venus passed in front of the Sun, that Venus would begin developing “horns” at its cusps. These “horns” were the result of the Sun’s light being refracted through the polar regions of Venus. Most amazing of all, were the occasions when half of Venus still had not made contact with the Sun, and yet, light was seen shining from the side of Venus furthest away from the Sun. In other words, the light from the Sun had been sharply refracted. At other times, a bright ring would form around Venus before contact, sometimes this would happen a day before or after contact with the Sun.

Figure 5.1. shows how the alignment of the Earth, Venus and the Sun would be during a transit. At point A , an astronomer would watch as Venus moves in front of the Sun. His line of sight is represented by the line AB. Point C, on the Venusian limb, is furthest away from the Sun and has not yet made contact with it, yet light from B, striking the Venusian atmosphere at C, would be refracted so that the astronomer at A would see this light. The angle BCA in Figure 5.1 is highly exaggerated of course because the distance between the Earth , Venus and Sun is considerable. Nevertheless , the Venusian atmosphere can refract the Sun’s light considerably, especially, in its polar regions.

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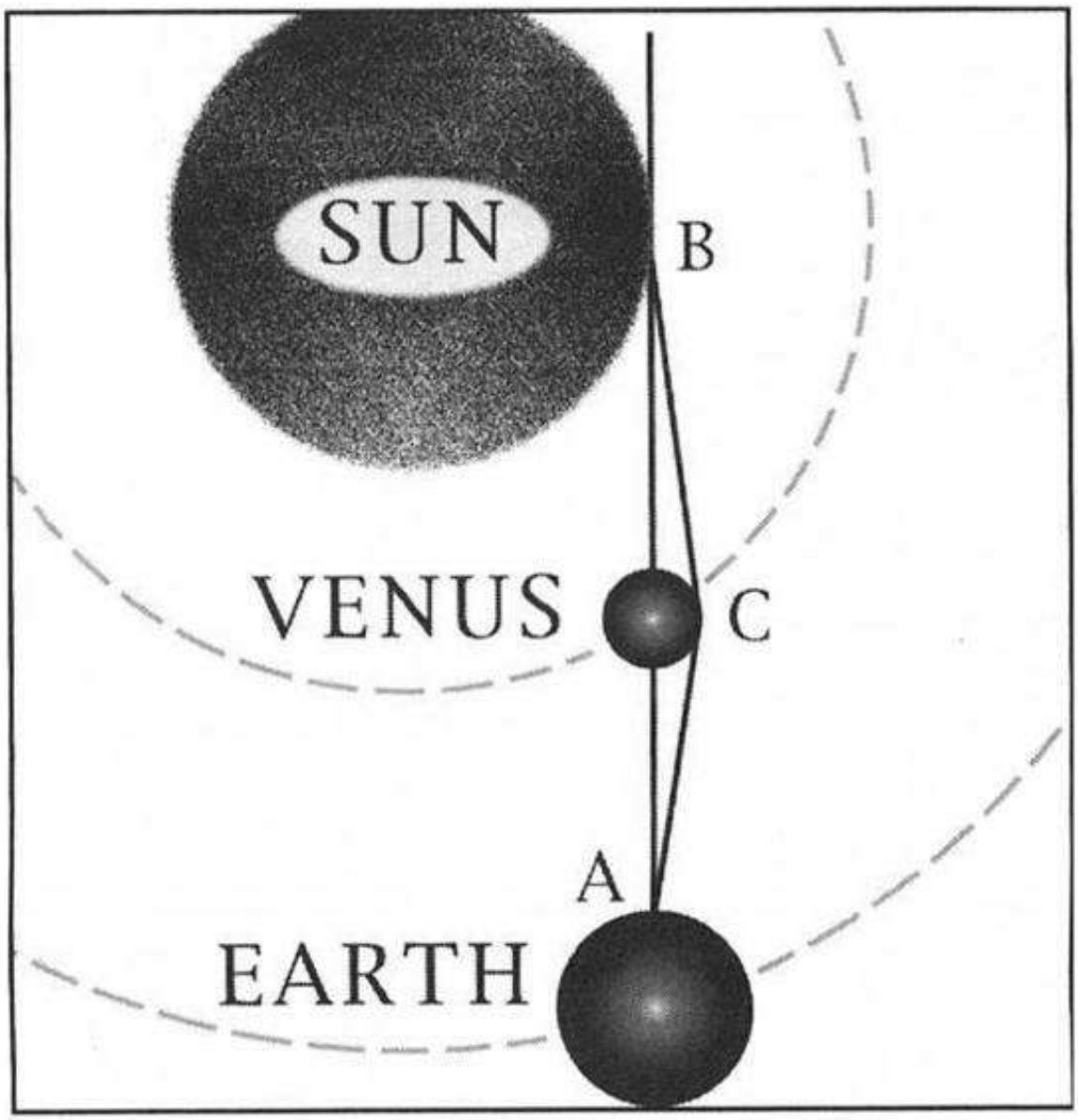

Figure 5.1

Annular Phase of Venus

Artist: Billy Baty

Here are some examples of observations of this phenomenon by competent astronomers. In 1883, J. E. Keeler wrote:

> . . . I looked, for indications of the atmospheric ring around the planet having been requested by Professor Langley to pay particular attention

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> to the physical phenomena of the transit, but for the first 3 or 4 minutes could see nothing of it. Shortly afterwards, however, I caught a feeble glimmer of light, almost star-like in appearance, on the limb of the planet farthest from the Sun, which at 20h 49m presented the appearance of a curved streak of very faint silvery light extending for a short distance along the margin of the unimmersed portion of the planet's disc. The brightest part of this luminous arc was not directly opposite the Sun, but was situated about 20° to the west of a line joining the centers of the Sun and Venus.
>
> **At the same time little horns of light**, **due perhaps to an optical illusion**, **appeared to rise from the cusps of the Sun at the margin of the planet**, **like the elevated rim of fluid which surrounds an immersed body through capillary action**.
>
> As the planet advanced, the arc of light gradually extended and brightened, until at 20h 54m, or nearly half way between first and second contacts, the unimmersed portion was completely surrounded by a luminous ring. The marginal patch of light now presented the appearance of a local brightening of a continuous ring of light surrounding the planet, and according to my impression at the time, lay without its contour. . . An independent drawing by Mr. Brashear with a reflector of about 6–inch aperture represents this spot of light as extending within the planet. At 20h 57.5m the appearance was still marked, and the ring of light quite brilliant around the planet. . .
>
> The phenomenon I have described was also observed by Prof. Langley with the large equatorial of the Observatory, temporarily reduced to six inches aperture, and by Mr. Brashear, of Pittsburg, with a Newtonian reflector. Langley estimated the center of the brightest portion to be 30° from the line passing through the centers, toward the west, giving a position angle 10° greater than that recorded by me at the time. . .

The appearance of Venus after the spot was first observed, and at 20h 54m, when nearly half immersed, is represented in the accompanying drawing.[12] Keeler's drawing can be seen below.

There are several points I wish to draw the Reader's attention to. This phenomenon was seen by several astronomers. Note how Keeler thinks he is

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seeing an optical illusion as he finds the light extending around the polar regions (where the cusps are). He finds it hard to understand why the light first extends along the cusps as if by a "capillary action." This illustrates the tremendous refractivity of the Venusian atmosphere. At its greatest, Venus is surrounded by a ring of light from the Sun even though only half of Venus has moved in front of the Sun. It would seem, from this account as if the Venusian atmosphere is especially refractive in its polar regions, and that is why the light extends along the cusps, forming "horns". Later it extends along the entire circumference of the planet.

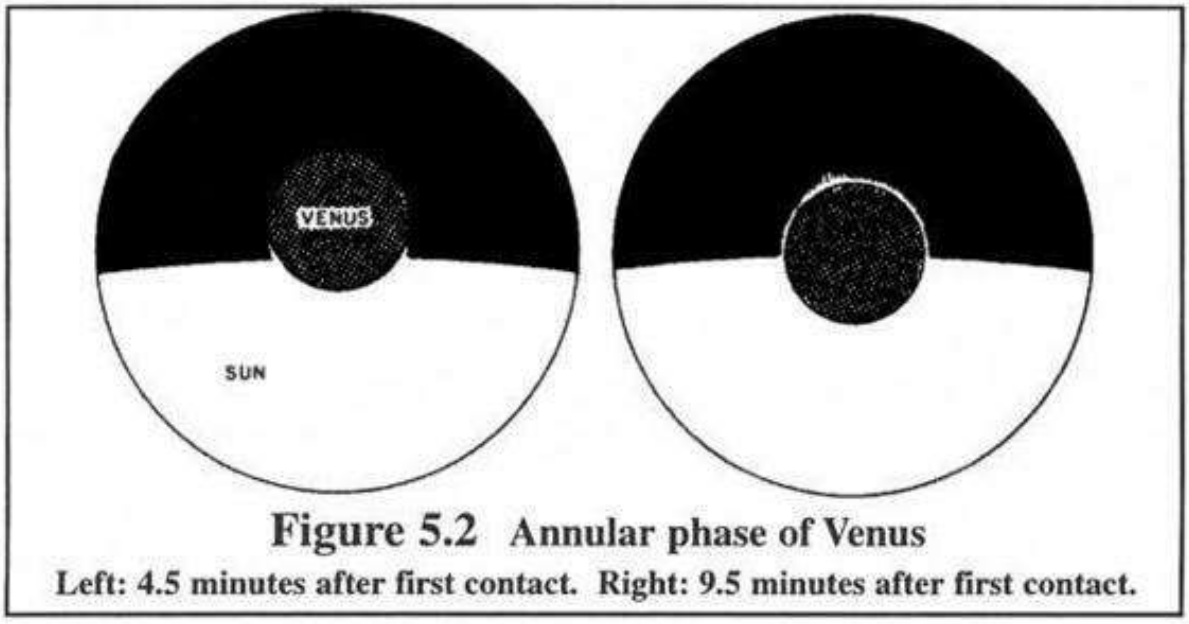

Figure 5.2 Annular phase of Venus
Left: 4.5 minutes after first contact. Right: 9.5 minutes after first contact.

C. V. Zenger tells us that on 8 Jan 1883, the whole disk of Venus was:

> . . .splendidly visible even to the unaccustomed eye of entirely uninstructed persons. . . But the most important feature of the observation was the ring, that I could detect all round the disk (dark part and crescent), of brownish-red color more pronounced on the illuminated side than on the dark part of the limb, but of a peculiar coppery hue.[13]

In 1890, L. Gibbs wrote about a phenomenon which he dubbed the "annular phase of Venus." Gibbs was sure that this phenomenon was being produced by light refracted through the Venusian atmosphere. He first saw the phenomenon 24 years earlier:

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> **I desired to observe the prolongations of the cusps of the crescent of light**, **mentioned by several writers**, **and which I afterwards found had been observed by Madler** (sic) **in May**, **1849**, **and used by him to obtain the amount of refraction in the atmosphere of Venus;** but I had not then read his paper on the subject, and was unacquainted with his formulae.

Gibbs not only saw the prolongation of the Venusian cusps, but he also saw the entire planet surrounded by a ring of light. The band of light was broadest on the side nearest to the Sun. He called two other students from his astronomy class to witness the event. One of them thought it resembled the annular eclipse of the Sun seen in October 1865.

During 1874 Gibbs had watched the planet on a number of occasions. On 2 Dec he noticed the prolongation of the cusps. Each day thereafter the cusps kept becoming longer and longer.[14] Gibbs goes on to state that a Mr. Lyman made observations similar to his. Mr Lyman used Madler's formula along with these observations to deduce the refractive index of the Venusian atmosphere. These were published in the *American Journal of Science and Arts* in January, 1875.

As we go through the various phenomenon related to Venus it will be seen that there are many phenomenon which are regarded as optical illusions. But are they? Many of these have an amazing consistency and continue to be seen.

This phenomenon is quite different to the one we see on Mercury which also occurs during transits. The ring around Mercury is seen only when Mercury is "inside" the Sun. This would seem to be a normal occurrence for a planet with an atmosphere. Note too, that Mercury does not always have this ring around it, hence the possibility exists that the atmosphere is not always there.

In the case of Venus, we see the ring before all of Venus is immersed in the Sun. These two rings therefore have totally different origins. Mercury may be the one with a temporary atmosphere, while Venus is the one with a highly refractive atmosphere. Venus, unquestionably has an atmosphere with an atmospheric pressure 92+ times that of the Earth. The issue here is the tremendously high refractive index of that atmosphere. These observations were confirmed by other astronomers in 1906:

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> Messrs. H. N. Russell and Z. Daniel describe their observations of this rare and interesting phenomenon, made at the last favorable conjunction in 1906, at the Princeton University Observatory, using the 5–inch finder of the 23–inch refractor. On 29 Nov, at 0507 GMT, the planet being only about 1° 49’ from the Sun’s center, it was possible when the air was steady to see the complete outline of the planet. On the side nearest the Sun it was bright and easily visible, but on the opposite side it was very faint, and could be seen only for a few seconds at a time. . .
>
> The ring phase of Venus may perhaps be visible again in 1914, if the atmospheric conditions are very favorable; after then there will be no further opportunity until 1972.[15]

The highly refractive Venusian atmosphere may be bending not only the light of our Sun. Perhaps it also bends light emanating from an Inner Sun which lies at the center of Venus.

ASHEN LIGHT OF VENUS

Sometimes a soft glow is observed on the night side of Venus. The radiated light is usually described as greyish, but it has also been described as greenish and coppery. There seems to be no pattern to the occurrence of the ashen light. Astronomers now recognise that it is a real and frequent phenomenon. Space probes have also studied it. It is currently thought that sunlight causes the disassociation of oxygen on the day-side of Venus. The atmosphere is thought to then transport this to the night-side where the atoms recombine and give off a glow. But if this process is always occurring then the ashen light should always be there. But it is not.

Let us examine the history of the phenomenon. On 9 Jan 1643, Riccioli reported a reddish hue on the dark portion of Venus. In 1873, A. Schafarik reported:

> It is well known that the unillumined side of the planet Venus has been sometimes seen shining with a faint grey light, like the dark side of the Moon when illumined by the Earth.
>
> Schroter in 1806 thought he had made for the first time this remarkable observation; but it was found afterwards that Harding had made it

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almost simultaneously, and Olbers pointed out an old observation made by A. Mayer at Gryphiswald in 1759. Arago found a still older observation of the same kind made by Derham at a date not fixed, but certainly anterior to 1729, the date of publication of the French edition of his *Astrotheology*.

Nevertheless this phenomenon is stated in the best text-books of astronomy to be one of the utmost rarity. Madler knows only two observers of it, the profoundly learned Humboldt only three, Arago only five; and even recently Dr. Winnecke, of Karlsruhe, believed that he was the only witness of that phenomenon in daylight since the time of A. Mayer; but under these particular circumstances it has been seen by eleven observers, and by five of them more than once.

It was known to me for a long time that there were on record far more observations of this phenomenon than is ordinarily supposed; and when, some years ago, I happened to be a witness of it myself, I undertook to collect all existing observations of it.

This I have now done; and as I have succeeded in collecting the surprising number of 22 observations, many of them repeated more than once, a short account of what I have found will perhaps be not uninteresting to astronomers.

1. The first observation recorded is that of William Derham, Canon of Windsor, referred to in his *Astrotheology* as made in the perigeum of Venus, probably in bright twilight, when he saw the dark side of the planet shining with a dim reddish light. Arago, who mentions this observation, quotes from a French translation published in 1729. It would be interesting to know if this observation is found also in the first English edition published in 1714.

2. The second in order was Christian Kirch, first astronomer of the Royal Academy of Sciences at Berlin. He saw the phenomenon twice [7 June 1721, and 8 Mar 1726], both times with moderate optical power and in bright twilight. He remarked that the bright crescent was apparently a part of a larger sphere than the faintly shining dark side. [*Astronomische Nachrichten*, No. 1586 vol. lxvii, p. 27.]

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3. Third came Andreas Mayer, Professor of Mathematics in the Gryphiswald University, who, on 20 Oct 1759, observed Venus, culminating only 10° from the Sun, with an unachromatic transitinstrument of only 1.5–inch aperture, and saw the whole disk ‘like the crescent Moon which reflects the light of the Earth.’ [*Observationes Veneris Gryphiswaldenses*, 1762, p. 19. Schroter, Beobachtungen des grossen Cometen von 1807, Appendix, p. 74.]

4. The fourth witness is Sir William Herschel, who about 1790 several times saw a part of the limb of the dark side in a faint light. Neither date nor time of day is given. [*On the planet Venus*, *Philosophical Transactions for 1793*.]

5. Count Friedrich Hahn, of Remplin, Mecklenburg, saw the phenomenon unusually well and often during the spring and summer of 1793, in twilight as well as in daylight. He employed excellent instruments, and gives a very detailed description of what he saw; also two sketches. No other observer seems to have seen the phenomenon so often and so well. [*Berliner astronomisches Jahrbuch fur 1793*, p. 188.]

6. The venerable old selenographer Schroter saw the phenomenon only once, February 14, 1806, in faint twilight, with an excellent telescope, and gives a very accurate description and sketch of it. He remarked an important feature in the phenomenon: the limb of the dark hemisphere was brighter than its central part. [*Berliner astronomisches Jahrbuch fur 1809*, p. 164, and Beobachtungen des grossen Cometen von 1807, Appendix, p. 66.]

7. Simultaneously with Schroter, and independently of him, C. L. Harding, at Gottingen, succeeded in observing the dark side of Venus on three different evenings 24 Jan, 28 Feb, and 1 Mar 1806. On the second of these days the light was reddish grey, and on all of them the phenomenon was seen with the utmost sharpness and distinctness. [*Berliner Jahrbuch fur 1809*, p. 169]

8. The well-known observer of the Sun J. W. Pastorff, at Buchholz in Prussia, saw the phenomenon (as he reports) many times so distinctly that he could distinguish bright and dark patches in the faint grey light.

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Only one date and a corresponding drawing are given, February 10, 1822, at 1700hrs., when the breadth of the crescent was 0.23 diameter of the whole disk. [*Berliner Jahrbuch fur 1825*, p. 235]

9. 8 June 1825, at 4 am, almost in full daylight, the phenomenon was witnessed by Gruithuisen at Munich. No particulars given. [*Astronomisches Jahrbuch fur 1842*, herausgegeben von Gruithuisen, p. 158]

10. The next observation was made by M. Guthrie, near Bervie, N. B. (Great Britain), during the inferior conjunction in December 1842. Mr. Guthrie saw a narrow fringe of light around the whole disk of the planet. [*Monthly Notices of the Royal Astronomical Society*, vol. xiv. p. 169]

11. G. A. Jahn, at Leipzie, saw the dark side of Venus on 27 and 28 Sept, 1855, at 11 am, in broad daylight. [*John's Unterhaltungen im Gebiete der Astronomie*, vol. ix. p. 320]"

12. Mr. Berry, of Liverpool, saw the phenomenon on the evening of 14 Jan 1862. [*Monthly Notices* vol. xxii. p. 158]

13. Mr. C. L. Prince, of Uckfield, observed Venus almost daily during her inferior conjunction between 23–30 Sept 1863, in bright daylight, and could trace on every day the whole disk, or at least a faint fringe of light around the edge. [*Monthly Notices* vol. xxiv. p. 25]

14. Mr. W. Engelmann, of the Leipzie Observatory, saw the phenomenon repeatedly, most advantageously, as it seems, on 20 Apr 1865, immediately after sunset. The dark side was greenish grey, a little brighter than the sky. [*Astron. Nachr. No. 1526*, vol. lxiv. p. 223]

15. During the inferior conjunction of 1867 Venus was well observed by Professor C. S. Lyman, of Yale College, Newhaven, U.S. The extension of the crescent over more than 180° was seen during a period of eleven days: on 10–12 December the thin bright crescent formed an unbroken ring; on the day of conjunction (11 December) the close proximity of the Sun permitted no observation. [*American Journal of Science*, 2nd series, vol. xliii. p. 129]

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16. Mr. Th. Petty, of Deddington, near Oxford, saw the dark side of Venus on May 23 and June 9, 1868, probably during twilight. [*Astronomical Register*, No. 68, p. 181]

17. In the same year I was observing Venus attentively for some months, chiefly in broad daylight, with a small but good achromatic. I saw spots on different occasions; and on 4 July 1868, at 1300, I could see traces of the dark disk, though unsteadiness of the air and insufficient optical power prevented me from becoming certain of what I saw.

18. On 5 Feb 1870, the dark side of the planet, then near inferior conjunction, was seen (in daylight, I suppose) by Mr. R. Langdon, of Silverton, Devonshire. [*Monthly Notices* vol. xxxii. p. 307; *Astronomical Register* No. 115, p. 163]

19. CPT W. Noble, of Leyton, Essex,saw the dark part of Venus very distinctly on 22 Feb 1870, only 24 hours before conjunction, in close proximity to the Sun. [*Monthly Notices* vol. xxx. p. 152; Astron. Reg. No. 88, p. 74, and No. 130, p. 258]

20. At the meeting of the Royal Astronomical Society, 11 Mar 1870, Mr. Browning stated that, without any special contrivance, he could see all the globe of the planet in his 12–inch speculum, perhaps on twenty different evenings, as Mr. Browning told me orally, and always in bright twilight. [*Ast. Reg.* No. 88, p. 74, and No. 131, p. 281]

21. On 9 Aug 1870, I was regarding Venus in bright sunshine at 1100, when a lady who was with me at that time immediately perceived the whole disk of the planet. I showed to her Schroter's drawing, which she declared to be in perfect accordance with what she saw in the telescope. I fancied only at moments that I saw a faint line of light all round the greyish disk. Illumination unusually large (0.35); air much disturbed at the time."

22. Dr. A. Winnecke, of Karlsruhe, saw the phenomenon twice, on 25 Sept 1871, at noon, and 6 Nov 1871, at 0500 [*Astron. Nachr.* No. 1863, and No. 1866, vol. lxxviii, pp. 236 & 287]

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From the above conspectus it appears that the unillumined side of Venus has been seen by 22 different observers: In twilight by 13 (once by 4, many times by 9). In daylight by 11 (once by 6, many times by 5). 4 observers saw a faint line of light encircling the dark disk, 19 of them saw the disk itself. Of the 22 cases reported, 12 have been observed during the last eleven years, say one per year; and I am disposed to think that the phenomenon is a normal one, and that with sufficient optical power and attention under a favorable sky it is to be seen at every interior conjunction, though I would by no means advance that it is constantly visible, which would be a statement directly opposed to facts.

For the explanation of this remarkable phenomenon the following causes have been suggested: 1. Phosphorescence. This was the idea of Sir William Herschel, Harding, and partly of Schroter. It does not appear clearly whether they understood the word in its modern sense, meaning substances which absorb sunlight and emit it in darkness without being chemically changed, or whether they included under that name, like all the elder physicists, slow combustions also, like that of phosphorus and rotten wood, which in modern terminology do not belong to true phosphorescence. In both cases it is difficult to imagine the whole surface of the planet to be covered with such substances as sulphide of strontium, diamond, phosphorus, or rotten wood.

2. Auroral phenomena. This was partly Schroter’s idea; it is supported by a most extraordinary observation of Madler, who, during the whole evening of 7 Apr 1833, saw Venus surrounded by long bright immovable rays. Prof. Zollner, of Leipzie, strongly advocates this idea, and trusts that the spectroscope will reveal bright lines in the grey light of the unillumined hemisphere of Venus.

3. Proper light. An explication upheld by Pastorff, who supposed the atmosphere of the planet to be large and self-luminous. Possibly also the planet might still be incandescent, as is supposed to be the case of Jupiter by Mr. Nasmyth; but on this supposition the secondary light should be always visible, which is positively not the case.

4. The light of the Earth. This, as seen from Venus, far exceeds the greatest brightness of Venus as seen by us; and according to the

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> calculation of Dr. Rheinauer, of Munich [*Grundzuge der Photometrie*, 1861, pp. 58–77], the grey light of Venus, if resulting from this cause, should equal a star of the 14th magnitude. That this explanation is insufficient is so clear as to need no further proof. . .
>
> Since the foregoing note was read before the British Association, Dr. H. Vogel has p u blished observations of Ve nus with the large re f ractor of Baron Bulow [*Beobachtungen auf der Sternwarte zu Bothkamp*, Heft 2,pp. 118–132]. He saw the secondary light of Venus on seven mornings between 15 Oct and 12 Nov 1871, in bright twilight. The light was yellowish, faint, brighter near the terminator, fading away on the other side, and never extended over more than 30° of arc on Venus. On five other mornings nothing was seen.[16]

Schafarik's report contains many instances of the night side of Venus being visible. For Venus to be visible all the way from the Earth, is must be emitting quite a strong light. Even at its closest approach to Earth, Venus is still more than 100 times the distance of the Moon from us. There is no point in making a long list of observations of the Ashen light phenomenon. Instead, let's concentrate on the stranger observations.

On 22 Apr 1873, H. Sadler of Sherborne, England, saw the dark limb distinctly. It was lit with a grayish hue. On the 24th, **at intervals**, **there seemed to be a brighter glow darting quickly across the dark limb from southwest to northeast**.[17]

In September 1863, near inferior conjunction, C. Leeson Prince saw the whole disk slightly illuminated, with **"a phosphorescence flitting of light around the edge of the entire disk**. The light flitting around the edge of the disk might be the Sun's light which is being refracted (i.e. annular phase of Venus.)

From 15 Oct to 12 Nov 1871, Voegel and Lohse saw the dark side lit by a secondary light extending about 30° from the terminator on seven mornings in bright twilight. This is an interesting case.

Throughout the whole summer of 1895, Antoniadi, at Constantinople, found the dark side clearly visible as inferior conjunction approached. Others also observed the phenomenon during this period. In this case, the night side of Venus was lit up for an entire summer. What causes the phenomenon to come and go like this? Herein lies one of the great mysteries of the ashen

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light. Why is it so irregular in appearance?

T. P. Battersby at Gibraltar observed the ashen light on 18 Oct 1906. He explains:

> This phenomenon, called by Webb 'The phosphorescence of the dark side,' is often questioned, but as it fell to my lot to have a very distinct view of it this year, I send you the simple statement of the facts."
>
> To my great surprise, I perceived the unilluminated part of the planet's disc clearly for the first time in all my observations of Venus. I called my wife to confirm my observation, and she at once perceived it and described it exactly as it appeared, namely, **as a faint segment**, **very much smaller in appearance than the completion of the circle of the bright part of the planet**. She observed a thin bright ring round the dark segment; but this I did not personally see.[18]

I wish to emphasize this: Sometimes the bright part of Venus is seen to be larger than the dark side on which the Ashen light appears. This might be due to the refraction of light from the Sun which lights up the rim of the planet. On 29 Dec 1957 and during the following two weeks the ashen light was unusually prominent. Dale Cruikshank wrote:

> . . .2. Ashen Light. What about the ashen light? Too many good observers have seen the illumination of the night hemisphere of Venus for us to write it off as an optical illusion. **N. Kozyrev in the Soviet Union has spectra of the emission which suggest auroral activity involving the excitation of molecular nitrogen** [*Publ. Crimean Astrophys. Obs.* 12, p. 169]. I have seen the ashen light only once, when Venus was two hours from inferior conjunction. **Some ALPO observers report the ashen light at almost any phase**, **sometimes as great as k = 0.82**. I strongly doubt the reliability of the observations.
>
> **If the ashen light is auroral in character**, **then we should expect it to be most conspicuous and frequent during periods of intense solar activity. Further**, **since the Mariner II space probe observations indicate absence of an intense dipolar magnetic field associated with Venus**, **we might expect auroral activity to be more uniformly distributed around the planet as compared to the strong polar**

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> **concentration observed on Earth. ALPO records are generally consistent with this interpretation, which some may consider ad hoc. The ALPO records should be compared to solar activity fluctuations to see if any degree of correspondence exists.**[19]

K represents the angle between the Earth and Venus. When k = 1 then Venus is on the opposite side of the Sun, as seen from Earth. In other words, some observers have seen the ashen light when Venus is almost 150 million mi away. Cruikshank seriously questions these reports. But is he right to discount reports like this? Perhaps he discounts and ignores these sightings because one is not supposed to see such a weak phenomenon from so far away? But what if these observations are correct?

In some ways the Ashen light of Venus seems to be a type of auroral activity. However, unlike here on Earth it is not confined to the polar regions. Something is lighting up enormous sections of Venus and sometimes the entire night side of the planet is lit up. Since Venus is almost the same size as the Earth the Reader may appreciate the scale of lighting we are talking about. What form of light could light up continent sized areas, so that it can be seen from 26 million mi, up to perhaps 90 or more million mi away? We are talking about something which happens on a considerable scale.

The first space probes which successfully investigated the ashen light were the Russian Venera 9 and 10 space craft. In 1976 they detected a glow on the night side of Venus. The glow consisted of a series of spectral emission bands with the strongest glow being 90 km above the Venusian surface. The maximum intensities observed by the Russian craft were strong enough to be seen by telescopic observers here on Earth.

The glow was found to be patchy and variable. It was dim near the dawn terminator and increased in brightness towards the evening terminator. Planetary scientists, C. A. Barth and G. M. Lawrence identified the emission bands. In an article in *Astronomy* it was stated that:

> The bands are caused by glow created from the combination of oxygen atoms in Venus' high atmosphere. The oxygen atoms probably arise from breakup of oxygen molecules due to action of sunlight on Venus' sunlit side.

The theory was advanced that the oxygen molecules were being split by

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sunlight on the day side of Venus. The superrotation of the atmosphere would then cause these atoms to be blown around the planet to its night side where the atoms would then recombine. The glow, which is thought to be similar to airglow here on Earth, is caused when the atoms recombine and emit a light. The light emissions are strongest at a wave-length of 4,792 Angstroms and occurs in at least 10 different wavelengths in the visible portion of the spectrum. It was thought that the patchiness of the glow is due to vertical currents in the atmosphere causing fluctuations of these molecules over a period of time.[20]

It has been suggested on occasion that the ashen light might be a type of auroral phenomenon. In 1965, J. S. Levine discussed the possible auroral connection:

> . . . that there was a pronounced maximum in geomagnetic activity at inferior conjunction during times of ashen light occurrence during the 1959–1962 period. **This result in turn suggests an auroral origin of this glow.**[21]

To summarize: In some ways the ashen light seems to behave like a diffuse aurora of some kind. The phenomena in the Venusian atmosphere are very complex. One sometimes has the annular phase at the same time that the ashen light is seen. Is there a link between the two? The ashen light is bright, for we can see it at Venus's closes approach of 26 million mi. D. Cruikshank mentioned that some astronomers claimed to have seen the ashen light when $k > 0.82$, which means that Venus was almost on the opposite side of its orbit. If so, then it means that some astronomers have seen the ashen light when Venus is almost 150 million mi away! Note too, that experienced astronomers often choose to view Venus in broad daylight to reduce glare. The night side of Venus has been seen under these conditions.

Some of the observations I drew attention to, seemed to exhibit a kind of auroral, or electrical or other nature—with the ashen light or some other kind of light flashing across the planet. Does this suggest some kind of electrical nature?

Kozyrev, a Russian astronomer of note, found that the ashen light might be caused by nitrogen. The Russian space probes found it to be due to oxygen atoms recombining on the night side of Venus. Scientists suggest that the ashen light is caused by oxygen being disassociated by sunlight. Why then is

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the ashen light so variable? Half of Venus is bathed in sunlight at any one time. The superrotation of the Cytherian atmosphere is constant. The entire atmosphere of Venus blows across the face of the planet in 4 days. Such oxygen atoms would therefore reach the night side in a day or two. If the ashen light is caused by disassociation of oxygen atoms on the day side of Venus why isn't it a constant phenomenon?

I quote again: "The glow is strongest on the dark side near the evening terminator with a decrease toward the dawn terminator. . ." The above is supplied as part of the proof that the ashen light is caused by the disassociation of oxygen atoms on the daylight side of Venus. The same article in *Astronomy* continues:

> This agrees with old visual observations of ashen light, which indicate that the phenomenon may be visible on a few days but absent on most other days.

After telling us that the ashen light is caused by sunlight, it then goes on to state that ashen light is absent on most days. Clearly, the ashen light is the exception and not the rule. Take for instance Battersby's observations of 18 Oct 1906, quoted above:

> . . . I perceived the unilluminated part of the planet's disc **clearly for the first time in all my observations of Venus**. . .

It is entirely possible that this disassociation of oxygen atoms occurs all the time and that we only see the ashen light from Earth when an abnormally large number of such atoms are recombined on the night side of Venus. We have to ask ourselves what events are suddenly taking place on the planet to cause such a sudden large scale phenomenon which can be seen up to 100 million mi away. It is this random distribution of the ashen light phenomenon which suggests that we are dealing with a subsurface phenomenon which cannot be explained by current theory.

And what is the connection between this and the geomagnetism which Levine mentioned? What if the oxygen disassociation is taking place inside the planet? What if a Venusian Central Sun were causing the disassociation in the first place? Quite considerable energy is required for disassociation to take place. Suppose there is oxygen and nitrogen inside Venus. This Inner atmosphere would be in contact with the Inner Sun. Its close proximity to this

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nuclear reaction would cause atoms to be ionized and disassociated. These molecules would remain inside the planet until such a time that powerful winds blow to the outside of the planet through Polar Holes. On such occasions these atoms will be spread across both the day and night sides of the planet. The only sign we would see of this event, is when the atoms on the night side recombine and glow. If this phenomenon continues for a time, then the atmosphere will rotate and bring the atoms which were on the day side of the planet around to its rear. The phenomenon can then continue for a few days and die down—and the night side of Venus can return to a state of darkness for days, weeks or months.

The refraction of light in the Venusian atmosphere may serve to confuse matters by letting us mistake some of the refraction of light from the Sun, with the ashen light, when the two are actually different phenomenon.

Kozyrev was the first to prove that the phenomenon was caused by the recombination of atoms. Confirmation from other sources was slow in coming. J. L. Weinberg and G. Newkirk reported that a four-month study of telescopic spectrograms in 1959 had found no emission spectra.[22]

During a four month period when Venus was at its closest there was no indication at all of atom recombination on the night side of Venus! Where were all the disassociated atoms then? The superrotating atmosphere of Venus causes winds to go completely around the planet in a mere four days! Why couldn’t Western scientists with highly sensitive telescopes obtain spectrograms, where Kozyrez had before? It was only in the 1970s that Russian satellites confirmed what Kozyrev had found. This phenomenon is so similar to Mercury’s disappearing atmosphere. Where did the oxygen and nitrogen atoms go to for four months?

The Reader has yet to be introduced to the super-rotation of the Venusian atmosphere. The Venusian atmosphere, for some unknown reason, rotates faster than the planet. The entire atmosphere moves around the planet in a mere four days. One cannot simply say that the atoms all remained on the day side of Venus. That is impossible. The high speed movement of the Venusian atmosphere would have brought the atoms on to the night side within a few days. Furthermore, the Sun shines constantly on the day side of Venus, presumably disassociating atoms all the time. Where did the nitrogen and oxygen atoms go to for four months? It was almost a 20 year wait before there was any confirmation of the phenomenon.

Could it be that oxygen and nitrogen exist in vast quantities inside

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Venus? Could this be why the phenomenon is so irregular? This would explain why scientists can study the planet for months without seeing any sign of this phenomenon. Of course, the phenomenon may vary in its intensity. It is possible that small amounts of disassociated atoms “leak out” all the time and that very small amounts are recombined. Such small amounts might not be visible from Earth, even at its closest. But what would cause those massive displays? What if there are violent storms which sometimes rage inside Venus? Something akin to those massive dust storms we see on Mars. Could such storms and Inner atmospheric disturbances cause vast quantities of disassociated atoms to be expelled from inside Venus? Would this be why the ashen light is so irregular in both size and period?

One idea I will raise time and again in regard to Hollow Planets is the idea of a possible loose coupling between a Central Sun and the Sun. Could it be that sometimes, the Central Sun inside Venus flares up in sympathy with our own Sun’s increased geomagnetic activity, thereby causing winds to blow some of these accumulated, disassociated oxygen atoms out? Perhaps that explains the very loose link between the ashen light phenomenon and geomagnetic activity observed early in the 1960s.

By demonstrating the abnormal distribution of disassociated oxygen atoms, along with the possible loose coupling with the Sun, I am proposing an answer which covers all the aspects of the Ashen light of Venus—an answer far more complete than any hitherto proposed.

Nitrogen is the major component of the Earth’s atmosphere, with oxygen being a lesser component. Could it be that the atmosphere inside Venus is somewhat similar to our own here on Earth? If we are only seeing a spill-over of part of that atmosphere, could it be that there are vast quantities of oxygen and nitrogen inside Venus?

Are there undiscovered laws of physics which would allow a planet’s Inner atmosphere to be different to the atmosphere on the outside?

I find it hard to believe that the atmosphere inside a planet would be different in composition to that on the outside. I would suspect that the constant interchange of air would mix up the atmospheres thoroughly. However I wanted to pose this question, because I doubt anyone has ever asked such a question before. It would seem likely to me that since the Inner atmosphere would be in physical contact with an ongoing nuclear reaction, that this is where a vast quantity of atom disassociation would take place. This may also be happening here on Earth.

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BRIGHT SPOTS

Now that the Reader is aware of the great refractive ability of the Venusian atmosphere, we can move on to another well-documented mystery. Strange bright spots shine on the day side of Venus for apparently no reason. This phenomenon may be related to the bright polar caps of Venus. It might be caused by an Inner Sun's light being refracted under suitable atmospheric conditions when various clearings exist in the atmosphere. Another possible explanation may be that these spots might be intense concentrations of disassociated atoms from inside the planet. They may be the day time extension of the Ashen light, except that one only sees them when they are so intensely concentrated as to be brighter than the rest of the clouds on the day side.

I had wondered if these spots could be caused by a Sun inside Venus. Could the light from such a Sun be refracted around the outside of the planet? The problem with this idea is that spots can be seen at considerable distances from the polar regions. One would also expect the light from such a Sun to be relatively regular and for it to light up all regions around a Polar Hole. Since these spots tend to move around and tend to be almost randomly distributed across the planet's surface it seems as if this is more of an atmospheric phenomenon—a day time Ashen light.

The Venusian atmosphere is similar to a thick mist here on Earth and one could argue that variability in the thickness of this mist might enable a Central Sun's rays to sometimes shine out of the planet. It is a possibility we should keep in mind. In the case of the bright Venusian polar caps we should definitely consider this as a part of the explanation.

When all things are considered however, I tend to favor the Ashen light as the explanation for these bright spots. But note how some of the following reports refer to bright spots with "scintillating, star-like" qualities which may favor some assistance from a central Sun. John Browning was observing Venus on 15 Mar 1868, with a 10.25–inch reflector. He writes:

> About half-past four pm, the Sun becoming partially obscured by some trees, I set Venus off upon the circles of the equatorial, and looking along the tube I saw that she was plainly visible to the naked eye, although the Sun was shining brightly. Viewing the planet with a power of 185, I found definition above the average. **The feature that first**

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> **attracted my attention was a curious oblong white nebulous spot, of considerable dimensions, shining with far greater brilliancy than any other part of the disc. This spot was on the edge of the disc, and fully 80° from the southern horn.**[23]

In 1868 Mr. De La Rue noticed a cluster of bright spots at the southern limb about 40° from the terminator. This is different to Browning's account. Browning saw one large oblong spot whereas De La Rue saw a cluster. R. Langdon describes an observation on 17 Apr 1873:

> . . . at 2000, I was viewing the planet with one of Mr. Browning's excellent achromatic eyepieces, when I saw two **exceedingly bright spots on the crescent**, **one close to the terminator**, **towards the eastern horn**, **and the other in the center of the crescent. These spots appeared like two drops of dew; they** were **glistening in such a manner as to cause the surrounding parts of the bright crescent to appear dull by contrast**. . . Cloudy weather prevented me seeing the planet again until the 19th, when the spots had disappeared, but the planet on this occasion was seen through the aurora, and **the irregular and uneven appearance of the terminator was most beautifully depicted. The whole body of the planet also was distinctly visible**.[24]

We see mention made of the "eastern horn" of Venus, as well as the entire body of Venus being visible. The entire body being visible is due to the mysterious ashen light of Venus. Could Langdon's observations be related to an enormous amount of air expelled from Inner Venus? Note how the entire night side of the planet was visible and how spots (greater concentrations of disassociated atoms?) also existed. As air currents cause these disassociated atoms to spread evenly across the surface the glow would then become more uniform. Could great concentrations of these atoms be responsible for making the Venusian terminator appear to be irregular?

The famous French astronomer L. Trouvelot reports:

> From 13 Nov 1877, till 7 Feb 1878, **two remarkable white spots**, **strongly reminding me of those seen on Mars**, **have been observed on the opposite limbs**, **near the extremity of the cusps. The southern spot**, **which always appeared the brightest**, **became very prominent from 16 Jan 1878**, **till 5 Feb**, **and appeared then to be composed of a**

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> **multitude of bright peaks forming on its northern border a row of brilliant star-like dots of light**. After the inferior conjunction, which occurred a few days later, the white spots were no more visible. This phenomenon has been independently seen by Mr. Seagrave of Providence, with his 8–inch refractor.[25]

This instance may be related to the existence of an Inner Sun. These spots are in the vicinity of the cusps (poles). He notes how the southern spot is generally the brightest. Of special interest in this description is mention of "brilliant star-like dots of light." Could it be that temporary clearings in the Venusian polar regions are responsible for some of the light from a Central Sun to be causing this? Later I will propose that the Venusian South Pole might have a larger hole than the North Pole. Note too that this was seen independently by Seagrave.

The brightness increased and decreased over a period of weeks. Note the very brilliant star-like points of light along the rim. Here we have an instance of both polar regions of Venus lighting up brilliantly for weeks at a time. It has been discovered that the cloud cover in the Venusian polar regions is extremely thick. Perhaps this is an exceptional instance where some of the cloud cleared enough to let light from below reach the cloud tops from where it can be seen.

On 17 Aug 1884 I. P. Guldenschuh, using a 7–inch reflector, observed a bright spot on the sunward limb of Venus in the position indicated in the sketch (See Figure 5.3) It was likened to a snowcap.[26, 27]

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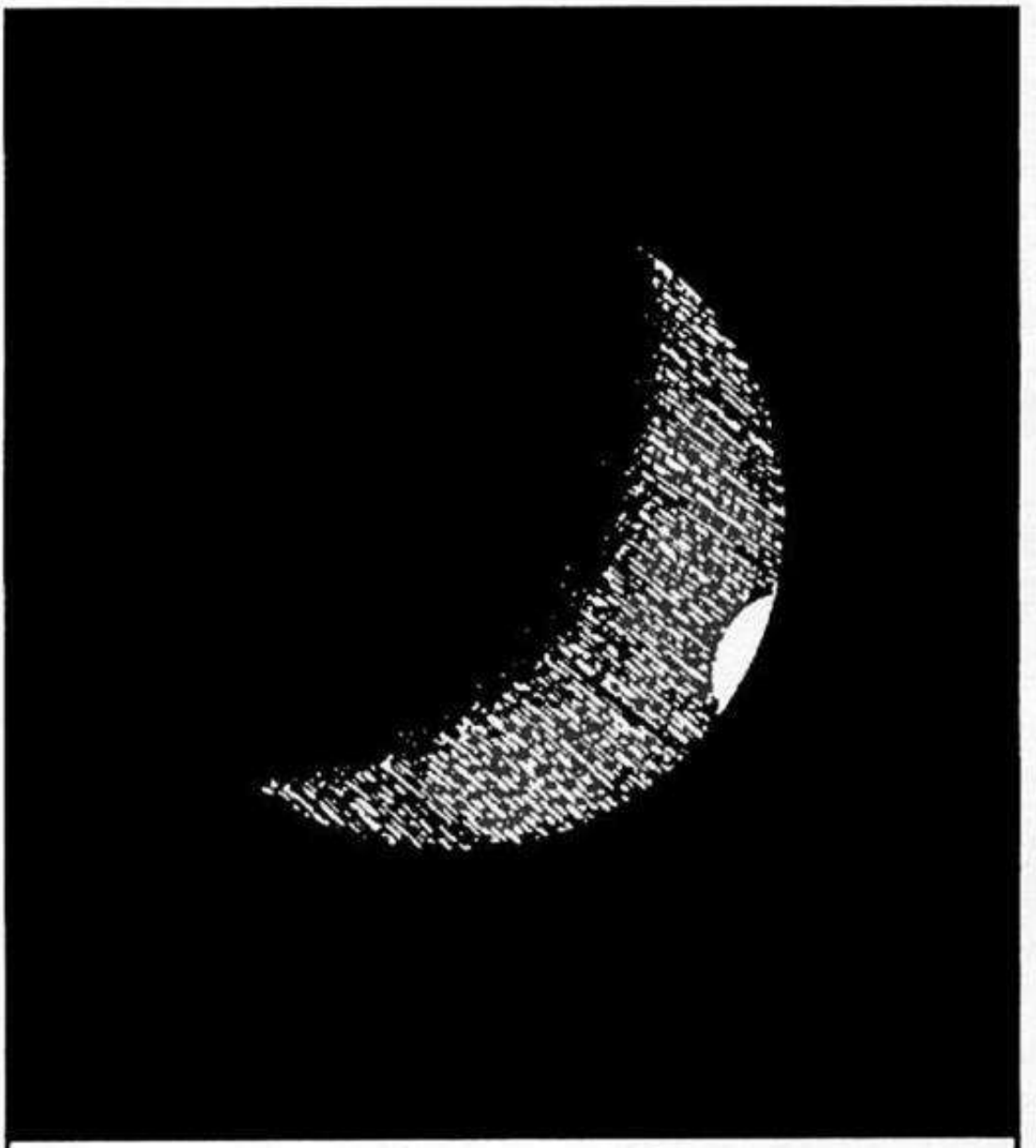

Figure 5.3

Bright lenticular spot seen on Venus 17th August 1884. *English Mechanic* (Model Engineer)

On 14 Jan 1910. B. Wymer reported seeing two diffuse bright spots on

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Venus's dark limb. A portion of the dark limb's edge was also easily visible.[28] This seems to be another instance of concentrations of disassociated atoms creating spots and then gradually spreading out and causing a more diffuse glow.

In 1956 Richard Baum wrote the following:

> In his valued reports on the activities of the Venus Section, Dr. James C. Bartlett, Jr. has from time to time had occasion to refer to a most peculiar phenomenon of the planet—**the 'star-spots'**, **minute stellar-like brilliants flashing white in contrast to their duller surrounds. Though attention has only quite recently been centered on these objects**, **they are not in any way 'new' to astronomy** .
>
> Some 150 years ago the famous German planetary and lunar worker J. H. Schroter observed then, in one particular instance of celebrity interpreting what he saw as a 25 mi high mountain! **Towards the end of the 19th century the eminent French astronomer**, **E. L. Trouvelot**, **frequently saw them**, **especially depicting them in great numbers around and within the north and south polar zone**.
>
> From his valuable memoir on Venus, published in 1892, we gather that he regarded these curious features as the snow capped summits of lofty peaks protruding up through the dense cloud layers of the planet's atmosphere. Early in the recent century another distinguished observer, E. E. Barnard, not only recorded them, but subscribed to Trouvelot's hypothesis and as a consequence attempted to employ the 'star-spots' as a means to determine the planet's controversial period of rotation. Needless to say he did not succeed.
>
> More recently Dr. Bartlett, Jr. has given the matter some thought and together with T. A. Cragg, another leading observer of the planet, seems inclined to follow both Trouvelot and Barnard in interpreting the manifestations. Over the period 1947–1954 I myself was able to see them. **According to the late H. McEwen**, **the venerable British authority on Venus**, **all the so-called classic observers reported**, **at one time or another**, **having seen these 'star-spots.'**
>
> However it is not the object of this note to discuss the nature of the 'star-

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spots' but rather to introduce them in order to differentiate their appearance from that of a most remarkable spot which I saw in March 1953, which at first sight seemed very similar to the accepted and known spots, but which upon reflection could not despite this facade be associated in any way with the 'star-spots'. This fact will emerge from a brief discussion of the general whereabouts of the latter, as we shall presently see.

Though there does seem to be a certain amount of individuality about the behavior of each observed 'star-spot', some remaining as hard steely points of light, others which appear to scintillate, and yet others that exhibit strong spectral effects, all have one property in common, all have been seen on the illuminated side of the planet. When, however, they have been noted off the sunlit side they have always been seen a little way inside the terminator, on the night side. They have never been seen off the disk of the planet. From these basic facts it would appear that (a) these spots rely on the Sun for their visibility, i.e. they are not artificial as some have been pleased to announce, (b) are the astronomical result of some comparatively rare phenomena of the apparent surface, and as a consequence (c) may be either towering cloud masses, which would seem to be the case with those noted off the terminator, or reflections from some cloud-bank so placed with respect to the Sun as to reflect the incident light in the observed manner.

Though this explanation would seem to account for the star-spots as such, it does not do the same for the observation now to be related. **Consequently I conclude that the nature of this unique feature is hidden entirely in the general ignorance that characterizes our knowledge of Venus**.

The observation under review was made in 1953 on 17 Mar at 1900 and continued until 1940 UT. Seeing conditions at the time were estimated to be 4 (scale of 10). Two instruments were used, a 6.5–inch reflector (f/7.4), 216 x, and a fine 3–inch refractor by Cooke (f/12), 120x.

Due to overcast skies it had not been possible to commence observations earlier than 1900, so that when the cloud thinned and cleared it was to

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reveal a rapidly darkening sky, a condition not conducive to accurate observations of Venus, through reason of the overpowering glare from the planet. However within the hour haze began to form and with this acting as filter it was possible to make an observation and even to attempt a drawing. Happily seeing conditions which before had been classed as 0.5 rose to 4. **Apart from some irregularities along the southern limb the most interesting part of this observation was the visibility of the dark side**, **a manifestation of that most curious phenomenon**, **the 'ashen light.'**

On this occasion the dark side was seen to be brighter than the sky, **as is the case when the planet is projected against a dark field**, **and to be veritably glowing with a strong phosphorescent glow of a deep ruddy hue. Upon closer inspection the whole of the dark hemisphere was found to be not uniform in hue but actually mottled over with minute nebulous granules. These were seen better by averted vision**.

It was whilst studying this strange structure, that my attention was deflected by what appeared to be a speck of light of about the eighth magnitude situated in the Southwest quadrant of the disk, i.e. in the southern part of the dark regions. The position angle of this feature measured round from the north point through west (in this case the right hand limb, taking west as right and the bottom as north, as with the Earth) was 171°. Its estimated distance from the terminator taken in angular measure from the drawing made was about 49°, where the disk is imagined flat. Nothing certain was seen by looking directly at the spot but by averted vision it was seen with certainty, **additionally I could not be sure but that it was scintillating**, **which could have been pure fancy though**.

Thinking that perhaps the object was due to an optical fault in the reflector, which was the instrument in use at the time, I switched over to the aforementioned refractor. A much sharper image was obtained and the dark side shone out with greater clarity. **The fine mottling was also more distinctly perceived. Above all however out shone the stellar speck. Thus having satisfied myself of its objectivity**, I at once returned to the reflector and continued to observe until 1940 hrs, after

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which time the planet could no longer be followed, owing to an irregular skyline, trees, and distant hills. At any rate it is doubtful whether anything further could have been done, seeing was dropping and there was a good deal of interference from mist along the horizon.

From the time observations commenced and the spot was noted, **no observable change took place in it**, **either in its light or in its position**. Owing to the fact of the planet's descent into the horizon mist bank the spot did undergo a fading, but this was not inherent as it was shared by the disk as a whole.

Quite naturally this strange experience enthralled me, and upon the next fine occasion I again looked for the mysterious speck, but to no avail. Later searches and a thorough combing through of my Venus books have revealed that this spot record stands as a unique observation.

Unfortunately the most critical part of this study stands as unconfirmed. As for the viability of the dark side, its reddish tint, and the fine mottling, complete accord has been found with an observation made at the same time as I was observing by an independent worker 200 mi or so away. For on this same evening at the same hour as I was so engaged, Mr. M. B. B. Heath, F. R. A. S., using his fine 10.25 inch reflector was similarly so. He described exactly the same appearance as confronted me, a notable point in view of the wide difference of instruments used and also the accepted difficulty of the subject, but failed to detect even the slightest trace of the light speck. In later correspondence Heath considered that differences in our respective seeing conditions at the time could have accounted for this, also the fact that he did not continue to observe after 1900, U.T.

To attempt an explanation of this report is to me fruitless; we know too little about the cytherean problem as a whole to consider an insignificant observation as this essentially is. Hence, **apart from making one point I will go no further. The object's great distance from the terminator obviously precludes its having been sunlit**, **unless of course it was situated away from Venus out of the planet's shadow**, **and so placed in the line of vision as to appear in the observed position. If not illuminated by the Sun and if a surface**

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phenomenon, what then?[29]

Dr. Bartlett, who was the head of the Venus section of the British Astronomical Association at the time held Richard Baum in high regard. He referred to him as a very gifted astronomer. In later years Baum was to take over this same position. Richard Baum is a close friend of a most famous English astronomer: Patrick Moore. Moore also holds Baum in high regard.

Baum's analysis of the 'star-spots'is very interesting. He first tries to explain them as a phenomenon caused by the Sun. He tries to explain the spots as high-level cloud phenomenon because they are seen slightly inside the terminator. He notes that these spots have been seen by all the classic observers. They seem to be a relatively rare phenomenon. Baum points to their brightness and their scintillating as an indication that they are caused by the Sun. However, his entire theory falls apart because of this one observation of his which shows such a spot 49° beyond the terminator. Such a spot could never be produced by the Sun, it is far too distant. So what causes it?

On this particular occasion Venus seems to have been extremely active. Baum states that the entire disk was covered in an ashen light of a ruddy hue. Again we have this relationship between bright spots and the ashen light. This particular spot seems to merely be a region with a high concentration of disassociated atoms. In this case its luminosity is obvious to all, since Baum tells us that light from the Sun could never have caused this.

It does not seem as if the classic observers wrote enough about the location of the bright spots for Baum to determine whether others also appear on the night side of Venus. So it may be that Baum's 'Spot' is merely the first documented sighting of such a spot far on the night side.

I contacted Richard Baum and asked him about some of these observations. He replied to me on 30 July 1996 and told me that Trouvelot made the most intensive study of bright spots. Baum also told me that there was another good sighting in 1985. He did not venture any guesses as to a possible explanation for the phenomena.

CONCLUSION

Venus remains mysterious to this day. Could the strange luminosity of the Venusian atmosphere be caused by irregular weather related to the

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existence of a Central Sun? Armed with the simple concept of disassociated atoms emanating from inside a hollow Venus, along with a bit of refracted light from a Central Sun, we find ourselves in a position to explain almost all the amazing and inexplicable phenomena seen on Venus.

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Chapter 6: Cusps, Horns, Notches, and Collars

BRIGHT POLAR CAPS AND BLUNT CUSPS

The polar regions of Venus have supplied us with many of the strangest observations of any planet in the solar system. Let's see if we can make any sense of this. Various bright and dark features appear in the polar regions of Venus from time to time. When they were first discovered various astronomers thought they were physical in nature (e.g. mountains) and they tried to use them to determine the length of a Venusian day. They were of course unsuccessful since these phenomena seem to be largely atmospheric in nature. The South Pole seems to be more susceptible to these phenomena than the North Pole. These features are recorded right up to the present day and remain largely unexplained.

At times the polar regions of Venus are brighter than the sunlit portion of the planet. Gruithuisen was the first to record the existence of the "polar hoods", on 29 Dec 1813. He likened them to the Martian polar caps. Space probes have confirmed the extremely high temperatures on Venus and we now know that the polar hoods cannot possibly be due to ice.

The polar regions receive less light than any other portion of the planet. So what is the cause of this exceptional brightness? Scientists currently claim that aerosols high in the atmosphere of the polar regions are the cause. Why should the Venusian poles be so extremely variable in brightness? And why is this phenomenon so random?

In 1871 Voegel and Lohse saw the phenomenon clearly from Bothcamp Observatory. In December and January, 1877 and 1878, respectively, G. V. Schiaparelli made an extensive study of a southern white spot and concluded that Venus rotated once in 225 days. On 15 Dec 1877, E. S. Holden at Lick Observatory, observed some spots. On the 18 and 20 Feb 1891, Trouvelot had some more observations of white spots. And in the summer of 1892 Schiaparelli made some more observations.

In Figure 6.1 we can see a drawing of the "polar hoods" or "polar caps" as seen by Trouvelot. Note how the terminator runs almost straight down the middle of Ve nu s except in the polar regions. Note too how the bright polar caps are brighter than parts of the equator which receive more direct sunlight.

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Look closely at the polar caps themselves and see how they extend into the night side of Venus where the Sun can't possibly shine. This is especially true of the one at the top of the drawing. There is a dark rim around the bright area. This is the Venusian polar collar.

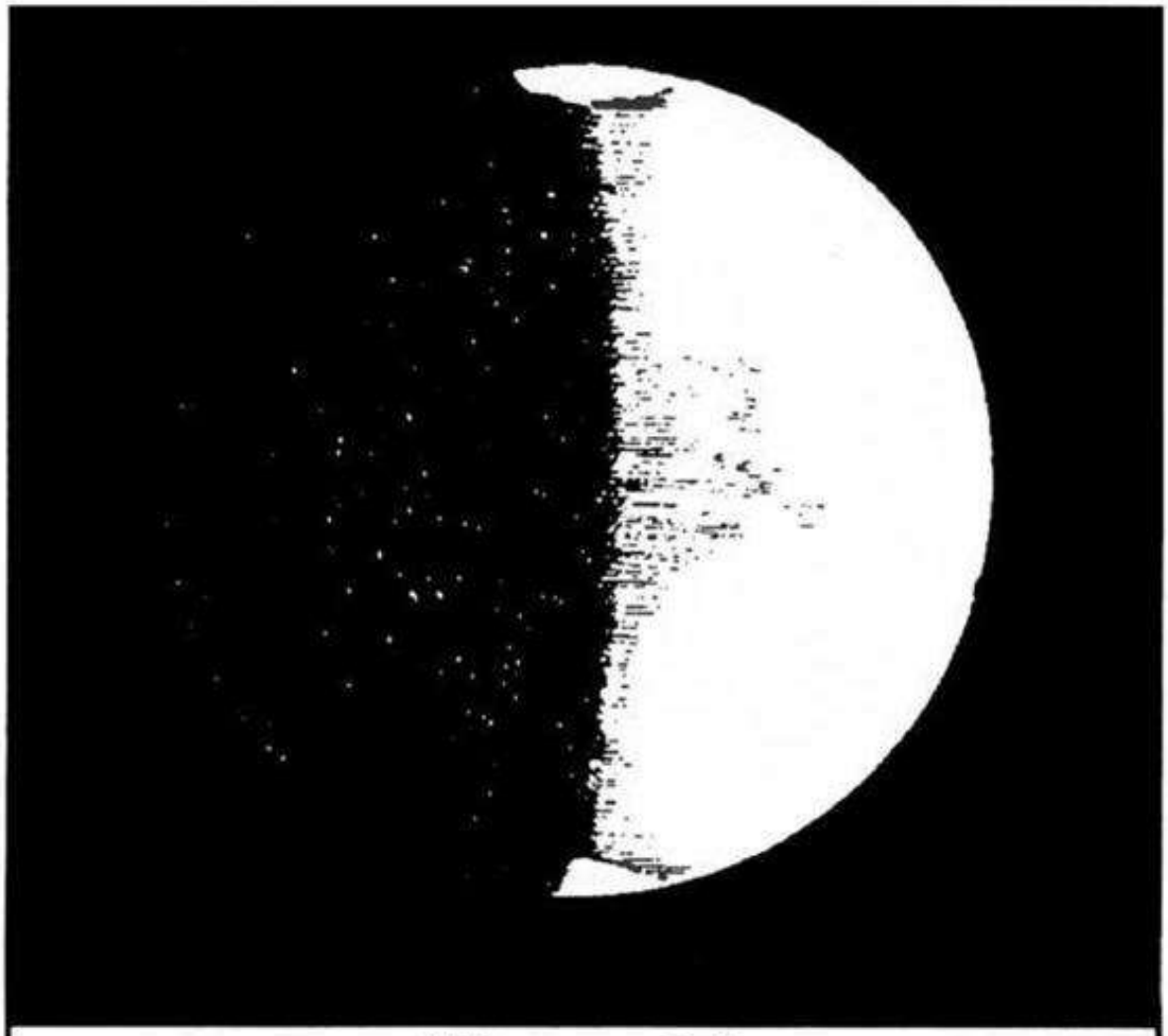

Figure 6.1
The Venusian "polar caps" drawn Feb. 20, 1891. Credit: British Astronomical Association

I asked Richard Baum about the bright polar caps. On 30 July 1996 he

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replied as follows:

> Bright hoods or polar caps on Venus were first accurately figured by Gruithuisen in 1813, and closely studied by Beer and Maedler 1836, Schiaparelli 1877–92, Vogel and Lohse 1871 and Trouvelot 1877–92. Until their confirmation by F. E. Ross in 1927 they were generally

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I asked Richard Baum about the bright polar caps. On 30 July 1996 he replied as follows:

> Bright hoods or polar caps on Venus were first accurately figured by Gruithuisen in 1813, and closely studied by Beer and Maedler 1836, Schiaparelli 1877–92, Vogel and Lohse 1871 and Trouvelot 1877–92. Until their confirmation by F. E. Ross in 1927 they were generally dismissed as contrast effects. Now they are identified with the bright polar cloud swirls imaged by Pioneer Venus. In 1974 Boyer analyzed 421 pictures of a homogeneous set of images taken at the Pic du Midi 1962–6 and 8 Mariner 10 images. **It was found the hoods did not brighten in the period 1962–6**. **Yet between 1967 and 1974 brightening occurred in 25% of the photographs**. **Visual monitoring of these features is highly desirable**.
>
> **The hoods vary in size**, **shape and position**. Trouvelot made an extensive study of them, and it is to him we owe knowledge of the bright spots. He depicted these especially around the borders of the polar hoods where they appear as minute stars of light. Barnard supposed they were the snow-clad summits of mountains protruding above the cloud layer.

In an article in the *Journal of the British Astronomical Association*, Baum explained:

> At the exceptionally favorable elongation of June 1927 Venus was photographed in the ultraviolet by Frank Elmore Ross with the 60 and 100–inch reflectors at Mount Wilson Observatory. **His images gave credence to many of the features described by visual observers**, **most notably the polar brightenings**.
>
> Scepticism evaporated and today they rank among the most frequent

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> observed features on the planet and are known to correspond to the very bright polar cloud swirls imaged in the UV by the space probes Mariner 10 and Pioneer Venus.[1]

In an e-mail to me, dated 3 May 1998, he commented:

> As for the bright polar hoods of Venus, **no doubt these exist but they vary in brightness and visibility**. **Dollfus at Meudon has photographic evidence of this**. **They are brighter than the rest of the planet**. **Sometimes they disappear and remain so for some considerable time**.

Baum states that these features were at first regarded as contrast effects until later proven to be real. Clearly the phenomenon is real, as proven by the comparison of the satellite images. What is really interesting is that during the years 1962–6 there was no brightening of these hoods at all. Baum also mentions that the bright hoods can disappear completely for a very long time. In Figure 6.1 one can see a dark rim around the polar region at the top of the drawing. This is the Venusian polar collar. No one knows why this feature exists.

Let us take a look at some modern NASA satellite photographs of Venus. The NASA commentaries mention a "polar ring." They use this to describe a very broad, bright belt which is centered on the poles. It seems to be similar in nature to the polar collar, except that the polar collar in drawings is always much smaller than the polar ring depicted in the NASA photos. Could these be two different phenomena? Or are they related? Plate 1 was taken on 14 Jan 1979. This is a pretty "normal" looking image of Venus. We are used to seeing this planet with its extremely thick and cloudy atmosphere. The NASA commentary which accompanies this photograph reads in part:

> This view made when the sub
> latitude was near 22° south best shows the southern hemisphere. **The ever-present bright polar rings are noted**, **with very interesting detail poleward of the southern ring**.

This photograph was taken at a distance of 40,000 mi above Venus.

In the top part of the photo one can see a very bright region. The rest of the planet is quite dull in comparison. Then some distance from the South

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Pole (bottom) of the photo one can see another exceptionally bright ring. Further south however, is a very dark band which stands out quite clearly. Plate 2 was taken from an altitude of 26,000 mi on 30 Dec 1978. The NASA commentary states:

> The dominant feature is the brightness of the polar ring regions; even without enhancement, these areas are 60% brighter than the darker equatorial region. Although Mariner 10 images showed the bright polar rings, **the intrinsic brightness seen during the 1974 encounter was about 50% less bright (relative to the equatorial region) than that typical for the current Cloud Photopolarimeter images**.

If we compare this to Baum's statements it then becomes apparent that the polar rings were even brighter during 1978 than they were in 1974. Why do they fluctuate so much in brightness?

In this rather strange image we can see how very dark Venus can become. What causes this darkening at the equator? Could it be a dust storm at the Venusian equator? Plate 3 shows the polar collar even more clearly. This photo was taken on 25 Dec 1978 at a distance of 39,000 mi from Venus. The NASA commentary reads:

> Because the image was made in a portion of the orbit when the latitude was near 25° S, we have a good view of the southern hemisphere, with the South Pole near the bottom of the picture on the morning terminator. The bright 'polar ring' feature which was also noted in the Mariner 10 images extends down to a latitude of about 50°. **In this view there are obvious circumpolar features poleward of the bright ring**, **including a sharp collar**. **The southern edge of a similar northern polar ring feature are the 'arms' of the apparent dark horizontal Y feature**, which had been seen both in ground-based observations and in the Mariner 10 images.

This photograph shows several things which are of interest to us. Firstly, there are the two 'arms' of the dark 'Y' feature. We will be looking into the possible causes of this mysterious Y later. The very bright area from the South Pole (bottom) up to the southern arm of the Y is what NASA refers to as the bright "polar ring." But within it, we can see the dark polar collar. It can be seen that this polar collar is a very real feature.

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Many of the strangest events on Venus take place in the southern hemisphere at its South Pole. In these images we see Venus only lit up by the light of the Sun. But there are accounts by reliable astronomers who have seen Venus do some pretty strange things in the past.

The polar regions of Venus also harbor other effects. Apart from becoming especially bright they can disappear altogether. Instead of the polar regions (cusps) ending in a sharp point as one sees on the Moon, they can become “blunted” and rounded. The tips then disappear altogether. On 28 Dec 1789, 31 Jan 1790, and 25 Dec 1791, J. H. Schroter noticed the blunting of the southern cusp. He also saw detached points of light beyond the blunted cusps. This can be seen in Figure 6.2.

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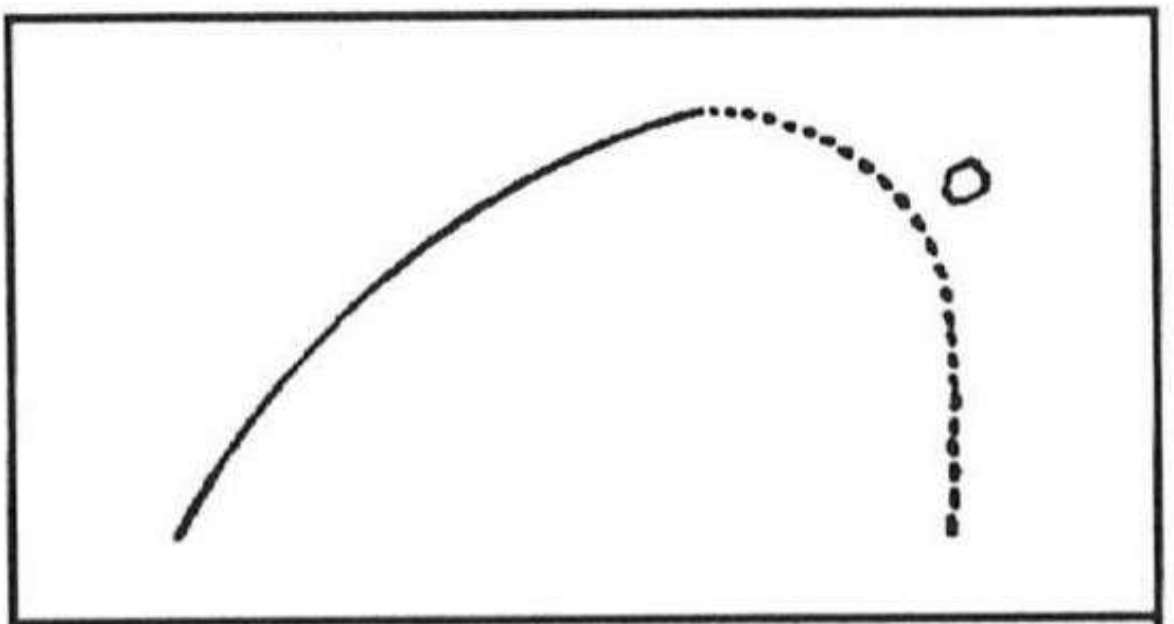

Figure 6.2

28th December 1789: Schroter sees a detached point of light off the southern blunted cusp.

Between the years 1833 and 1836, J. H. Maedler confirmed the cusp truncation or blunting phenomenon.[2] In the winter of 1853–4, James Breen, at Cambridge, frequently noticed blunting of the southern cusp. In May and June of 1876 white spots were seen near the cusps.[3] The above sightings illustrate the similarity between the bright Venusian ‘polar caps’ and the Martian polar caps, even though atmospheric conditions on these two planets are vastly different.

Drawings of Venus by S. Bolton made early in 1900, reveal

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considerable cusp blunting and bright areas at each pole.[4] Another drawing of Venus by S. Bolton shows a bright spot on the southern cusp. The cusp also seems to be blunted at first glance. Bolton did see the complete point of the cusp, but it was very faint.[5] On 10 February 1913 a bright sector was seen near the southern cusp.[6]

On 22 May 1927 there was a pronounced blunting of the southern cusp in conjunction with terminator irregularities.[7] This observation in 1927 by Mead is intriguing. He noted that the terminator was not a perfectly straight line. This might simply indicate lots of dark areas. Could there have been considerable atmospheric activity on Venus? Could there have been violent dust storms which caused the blunting of its cusps and the terminator irregularities? The southern cusp of Venus is blunt more often than the northern one. This might indicate that a southern hole is larger than a northern one.

On 16th July 1919, C. Flammarion reported sighting polar caps on Venus.[8] The Royal Astronomical Society of Canada reported several sightings of "polar caps" on Venus in 1954.[9] In 1963 Dale Cruikshank wrote:

> **Observers of Venus often note that one or both cusps are abnormally bright compared to the remainder of the disk**. (Dr.) James Bartlett [*Strolling Astronomer*, 12, 4–6, 1958, p. 43] contributed a very worthwhile paper on his statistical analysis of his own observations, those of Owen Ranck, and those of a group of ALPO observers lumped together. **For the present time we will call these anomalous brightenings 'cusp caps'**, **though this term suggests a physical interpretation that is unproved**. **Bartlett showed that one or both cusp caps were visible in 54% of the observations (477 out of 830 observations)**, **that the south cap alone was visible 11% of the time**, **the north 7%**, **and both caps simultaneously 35%**. **These figures correspond closely to those obtained when Bartlett's 221 observations or Ranck's 158 observations are considered alone**. **I believe that we can attach considerable significance to these values**, **particularly because both Bartlett and Ranck had such a long and continuous series of observations**. This is prerequisite to a statistical study of features like the cusp caps.
>
> **Bartlett also found that the cusp caps appeared at virtually all**

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phases of the planet, **from which he concluded that seasonal effects on the planet are not important in governing the appearance of the caps**, **since all positions in the orbit were represented by cusp cap observations**. This last statement does not follow, however, since phase is not uniquely related to Venus' heliocentric longitude alone, but also to the difference in heliocentric longitudes of Venus and the Earth. [*Author's note*: He is saying that Venusian Phases, as seen from the Earth do not correspond to Venusian seasons since the absolute positions of the two planets with regard to the Sun are always changing. Earth and Venus are in constant motion and they encounter each other at different positions in their orbits. The Venusian phase does not indicate the Venusian "season". Bartlett's attempts at correlating the bright cusps with phase still does not tell us whether the bright polar cusps are caused by the Venusian seasons. It does not seem as if the link to the Venusian season has been properly studied].

Bartlett's work indicates that the south cap was most often the larger of the two. Some reports of details seen in the cusp caps were mentioned, but are probably not reliable enough for useful analysis. Dusky cusps were also discussed, but these are reported far less often than bright cusps.

The very fact that bright cusps occur indicates that the Lambert Law of Diffuse Reflection from a sphere is not strictly applicable to Venus, **as we also saw in section 3**. [*Author 's note*: The above comment is interesting. Suddenly this scientist "revokes" a physical law in order to explain this phenomenon.]

Bartlett appears to favor the interpretation that bright cusp caps represent the actual poles of rotation of the planet, **and that the inclination of the polar axis to the orbit plane must be small since the caps were seen at a wide variety of helio-centric longitudes**. This does not follow, since we can only say (on the basis of a "polar cap" sort of interpretation) that the angle of inclination of the axis to the orbit plane is less than the angular extent of the larger cusp. This is the case with Mars (and with the Earth, correcting for the asymmetry of the caps). In fact, it would be of some interest for ALPO observers to make

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a continuous and consistently good series of observations of the angular extent of the cusp caps so that a statistical analysis could be made to determine the best value of this quantity. While it is not totally fair to judge Bartlett's 1958 interpretation in the light of 1962 observations, the recent infrared studies of **Venus reported in many recent journals make it clear that the surface temperature of Venus precludes any sort of ices which could form the bright polar caps as required by Bartlett**. P. Moore dismissed this idea some time ago (*Journal of the British Astronomical Association*, 65, 6, p. 232, 1955); **and most astronomers**, **knowing that the surface temperatures on Venus are very appreciable by inference from atmospheric temperatures**, **rejected the idea of ice polar caps many years ago**.

C. M. Pither (*Journal of the British Astronomical Association*, 73, 5,p. 197, 1963) **has suggested on the basis of the frequent correspondence of cusp caps to the time of solar flares in 1961 that the caps are auroral in nature**. **The examples Pither gave**, **however**, **correspond to flares of class 1 or 1+**, **which are not prone to produce terrestrial auroral activity**. **Furthermore**, **some of the flares that Pither cites were invisible from Venus at the time of the cusp cap observations** (see Cruikshank, *Journal of the British Astronomical Association,* in press). While statistics such as Pither proposes are of some interest and should be examined for ALPO and individual observers' records, Pither's own are not convincing to me. **In fairness**, **we must admit that it is possible that auroral mechanisms in the Venus atmosphere may be triggered by flares which we ordinarily consider unimportant (1- to 2); the geometrical factor remains that flares must ordinarily occur within about 45° of the center of the solar disk as seen from the planet before intense magnetic storms are induced**. **Further**, **Venus does not seem to have an intense magnetic field by which to concentrate auroral activity toward the poles (Mariner II observations)**.[10]

From the above we can see how the debate raged as to the cause of the cusp caps or polar hoods. Dr. Bartlett suggested ice. Both Patrick Moore and Dale Cruikshank discounted this possibility. Pither on the other hand tried to a show a relationship between them and possible auroral activity. In recent

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years scientists have opted for aerosols. But if this were the case why is the brightness of Venus in its polar regions so extremely variable and virtually unpredictable?

One interesting fact that Dr. Bartlett noted is that often (35% of the time) the cusp caps appear at both poles at the same time. This suggests a common link. Why would the weather at both extremes of the planet produce aerosols at the same time? What is the connection between the two? The one connection could of course be through the center of the planet. Could it be that a certain excitation of a central Sun could cause air to flow out of Inner Venus and to then simultaneously create bright polar caps at the same time?

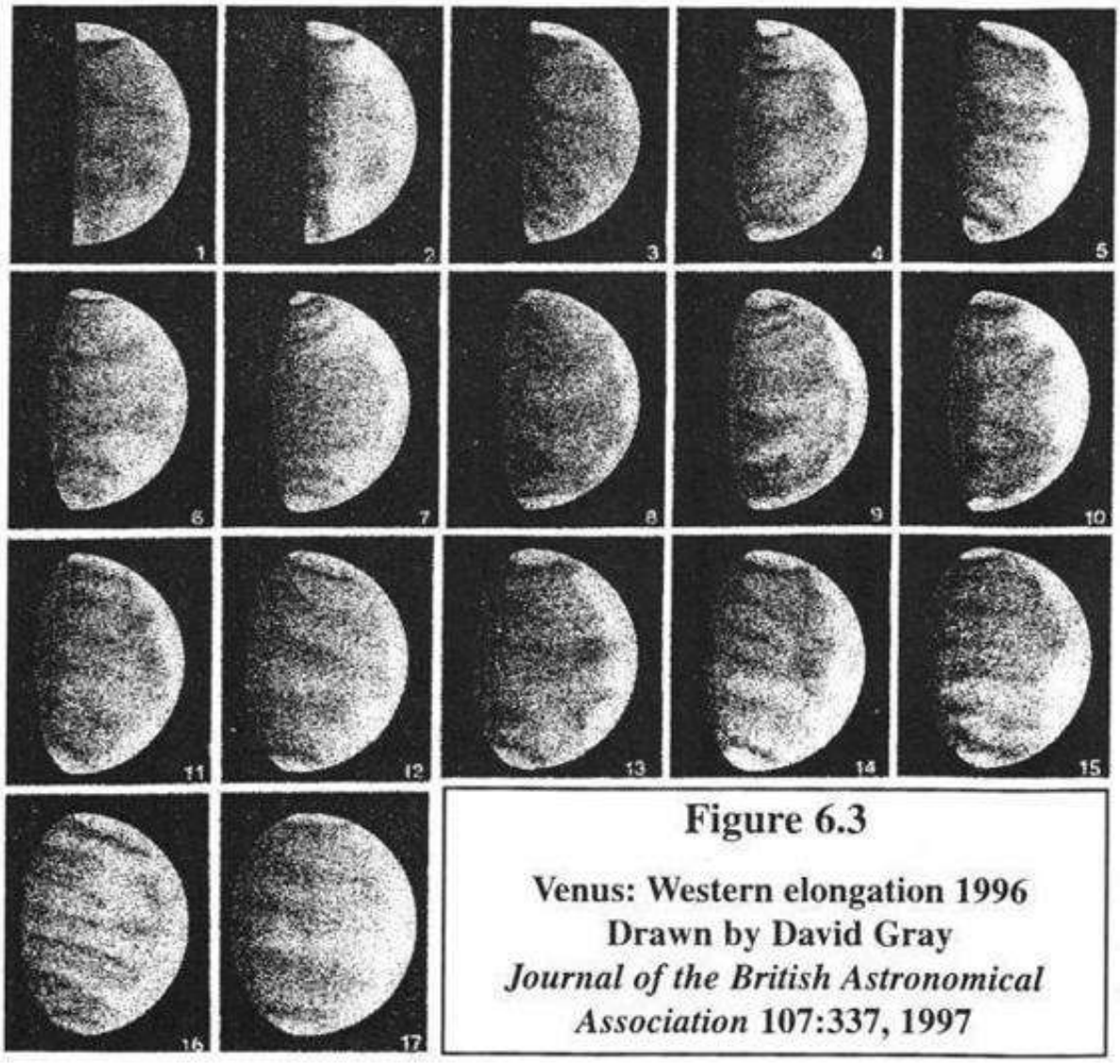

Figure 6.3

Venus: Western elongation 1996
Drawn by David Gray
***Journal of the British Astronomical Association* 107:337, 1997**

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Cruikshank appeared to be at a loss for an explanation of the polar hoods himself. The bright Venusian cusp caps are constantly being seen by observers. Take a look at the excellent series of drawings in Figure 6.3. These were drawn by David Gray during the period 22 Aug to 23 Nov 1996 using a 415–mm telescope. He tried various combinations of filters and obtained these excellent results. The bright cusp caps are clearly visible. Note how exceptionally bright they are in comparison to the rest of the planet. In many of the drawings the cusp caps are the brightest part of the planet. In some, they are only matched in intensity by the subsolar point (where the Sun is directly overhead, on the far right). Note how the intensity and size of the cusp caps change and how they sometimes disappear completely (drawing 8).

At the time Richard Baum was interested in the bands shown in the drawings, but he couldn't help remarking on the brightness of the cusp caps:

> The drawings repay careful study. For instance, besides changes in the bright cusp caps, there is evidence of shift in the coarse pattern of markings.[11]

The great French Astronomer, Antoniadi wrote:

> The question of the rotation period of Venus is one to which the reply has eluded many a distinguished astronomer. Nor is the reason of the failures far to seek. The determination is in itself impossible by ordinary visual methods on account of the formidable diffusion of light by the planet's atmosphere, and until the day arrives when the Doppler–Fizeau principle can be successfully applied to the limb of Venus, we may justly display skepticism as to the value of current rotation periods. . .
>
> The honor of demolishing these fanciful results belongs to Professor Schiaparelli, who, in a masterly discussion of all the observations, concluded that 'the rotation of 23h 21m or 23h 22m of Jacques Cassini, Schroter and De Vico, is the result of a series of paralogisms and vicious circles.'
>
> Taking as a base the immobility of some spots relatively to the terminator, the illustrious Director of the Milan Observatory concluded that Venus constantly presents the same face to the Sun, or, in other words, that the rotation period coincided with the 224.7 days revolution

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round that luminary. Professor Schiaparelli's observations extend from 8 Dec 1877 to 6 Jan 1878.

The fixed spots forming the ground work of the 224.7 days rotation may be described as follows:

(1) An elongated dusky shading HM trending obliquely from the south cusp along the path **In 1877 Schiaparelli saw** of a great circle of the dichotomous or crescent **a dark band around** phase; (2) A bright spot H near the cusp, bounded **Venus's Southern cusp**, on the left by (3) A slight diffused shading P.

Professor Schiaparelli notes that the spot H **plus a dark radial streak** was seen by Professor Holden on 15 Dec 1877; that something like H and P was observed by Gruithuisen in 1813 and 1814, and by Vogel and Lohse in 1871.

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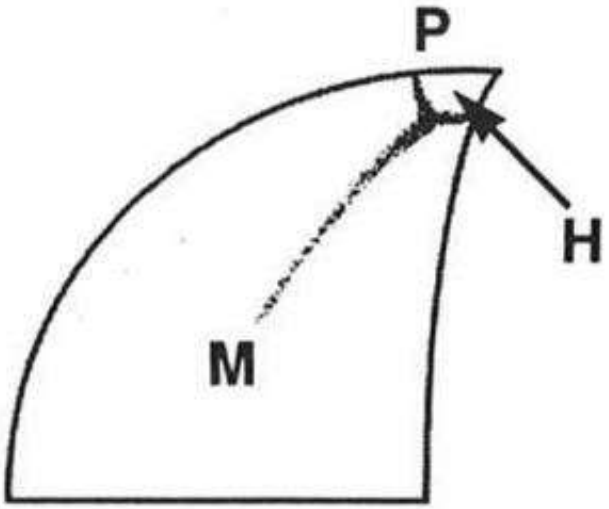
Figure 6.4

In 1877 Schiaparelli saw a dark band around Venus' southern cusp, plus a dark radial streak.



Credit: Antoniadi, E. M.; "Notes on the Rotation Period of Venus," *Royal Astronomical Society, Monthly Notices*, 58:313-320, 1898

Scarcely had Professor Schiaparelli announced his results, than M. Perrotin,

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starting from the apparent immobility of a vertical shading with regard to the terminator, concluded that Venus rotates in a period comprised between 195 and 225 days. M. Perrotin's drawings are of very great value. But we should point out here that he confirms Professor Schiaparelli by using a spot which, in spite of its immobility, was rejected by the great Italian himself in his determination of the planet's rotation period. In fact, M. Perrotin's vertical shading is obviously identical with the spot seen by Schroter in 1788, and of which Professor Schiaparelli said 'The general stability of its form, which lasted for more than two months, its constant parallelism with the terminator, its almost invariable distance from the latter suggest that we have to deal here with some phenomenon of the atmosphere of Venus, depending much more on the Sun, and consequently on the terminator circle, than on any axis of rotation whatsoever.'[12]

The rotation period of Venus, like that of Mercury has always been a problem. Antoniadi commends Schiaparelli for his work. However it turned out to be all wrong. Venus does not present the same face to the Sun. Nevertheless, Antoniadi's arguments are good. He compares the observations of many astronomers over the months and years and attempts to demonstrate the existence of a dark polar collar which has a bright feature within it.

This illustrates the virtual permanence of the polar collar and its behavior. Is the polar collar of Venus caused by a hole in its crust? Are the bright polar caps caused by an Inner Sun or by disassociated atoms emanating from inside the planet? Are these disassociated atoms related to the bright aerosols which scientists believe to be the cause of the brightening? Are these disassociated atoms creating a luminosity which is greater than scientists currently appreciate?

And what of the blunted cusps? What if winds blow out of Inner Venus carrying dust? Could it be that the darkening and total disappearance of the polar caps is due to excessive dust? We will be returning to these mysteries again.

THE HORNS OF VENUS

Both Venus and Mercury go through Moon-like phases, as befits planets closer to the Sun than the Earth. Venus, however, does not present the telescope user with a uniform, mathematically precise phase. Sometimes the polar regions (cusps) of Venus "extend" into areas where the Sun's light

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cannot possibly be falling. These extensions of the Venusian cusps are called the “horns” of Venus. These horns are often much brighter than the rest of the crescent. The horns may project farther than the laws of optics allow (i.e. beyond 180° at “Half-Moon” phase).

Figure 6.5 illustrates how the Venusian cusps can extend into regions not lit by the Sun. On 13 May 1881, E. L. Trouvelot drew Venus with the crescent covering about 250°.[13]

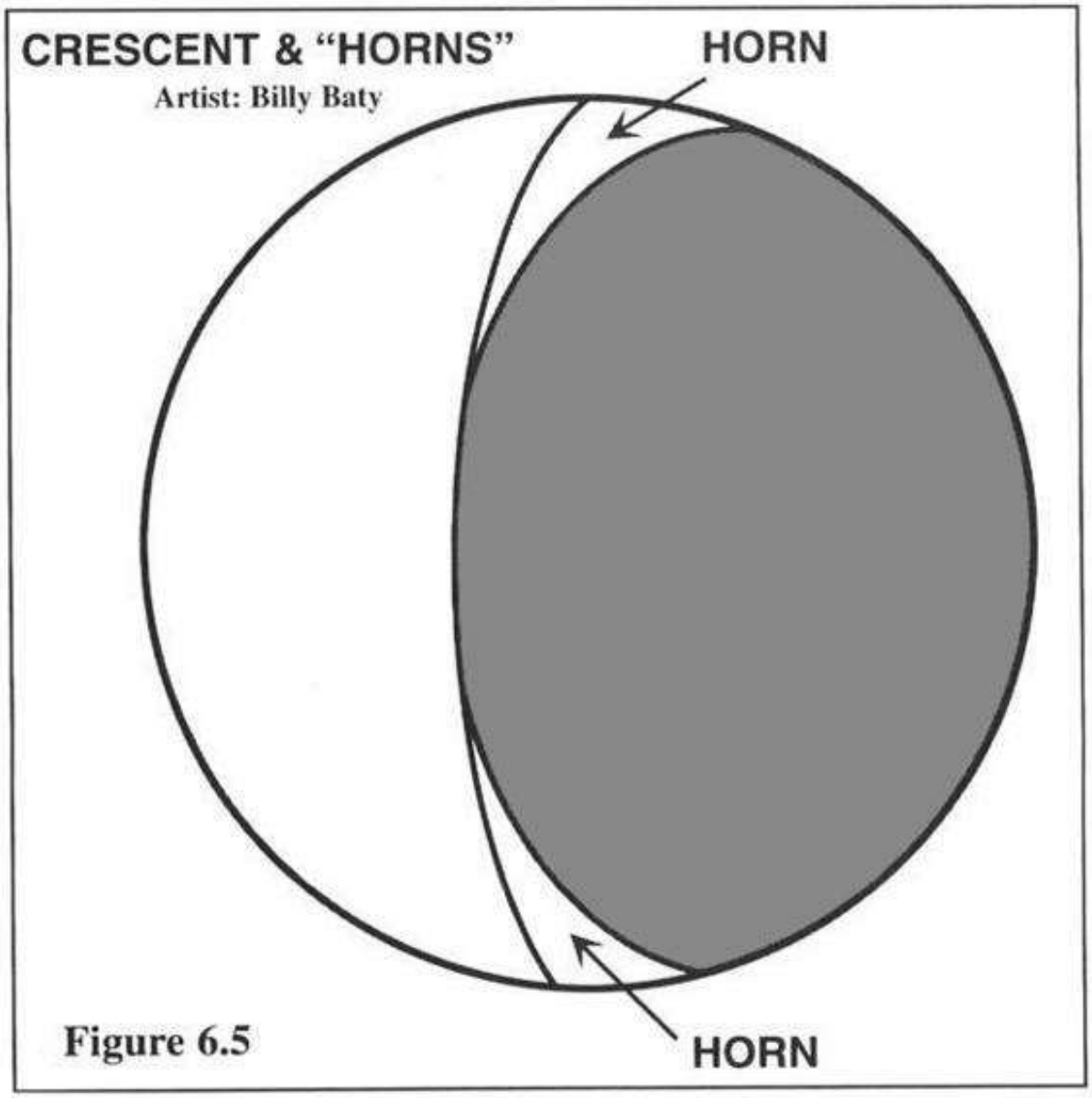

Figure 6.5

On 2 Jan 1886, I. G. Lohse, using a 15–inch refractor at Scarborough, England, noticed a narrow streak of light, in length about one-twentieth of

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Venus's diameter, extending the northern cusp but still separated from it. On 28 Jan 1894, the cusps of Venus extended well beyond the planet's axis, showing that a refractive gas surrounds the planet.[14] H. MacEwen wrote about an observation of his on 4 July, 1895:

> . . .regarding the extension of light in the southern part of the planet. . . I made a similar observation on the 4th inst. Referring to the inclosed diagram, (line) ab represents a bright bluish extension, gradually getting darker towards the dotted line cd, which defined the northern limit of this shading. The full line is the outline of Venus, and the dotted line shows the dim partial outline of the dark side." See Figure 6.6.[15]
>
> Here we see part of Venus being lit by a dim light which seems to be centered on its South Pole. A. Southgate on 15 Mar 1913, show prolonged cusps.[16]

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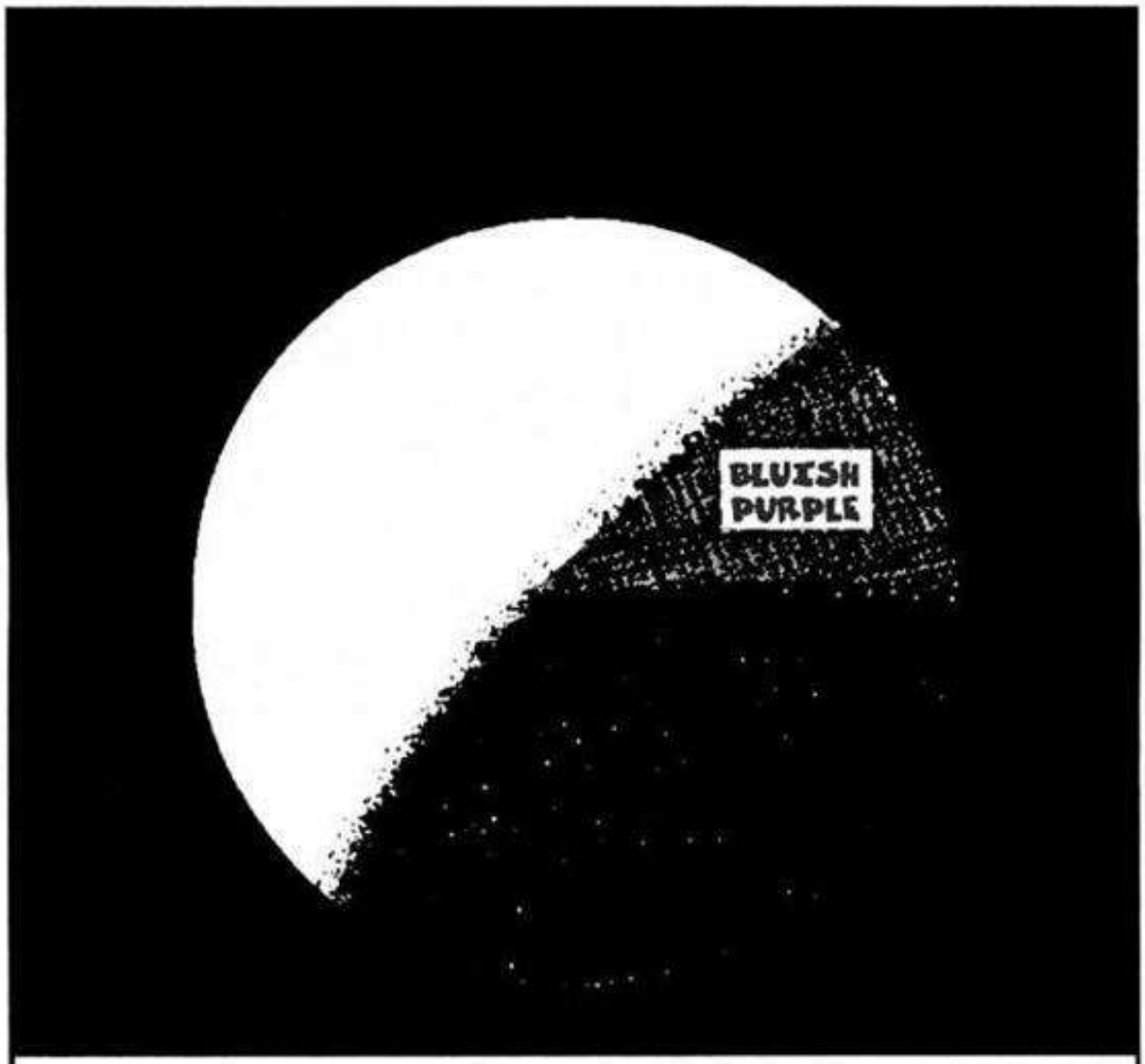

Figure 6.6
July 4, 1895. Bluish-purple extension of Venus' southern cusp. *English Mechanic* (Model Engineer) 61:567, 1895

Prolongations at both cusps were reported by T. L. Cragg on several successive days during April 1949.[17] Note how the prolongation of the cusps lasted several days just as the ashen light does sometimes. Sometimes detach e d luminous points and fragments are seen hovering off the cusp extremities.

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On 2 Apr 1870 A. P. Holden observed a detached bright speck hovering off the northern cusp. On 30 and 31 Mar 1881, The Rev. T. E. Espin reported ‘tiny brilliants’ near the southern cusp resembling detached mountain peaks.

COLLARS AND DEPRESSIONS

Venus is quite a complicated planet isn’t it? Let us continue with our run-down of Venusian atmospheric phenomena. Later I will bring all this data together so we can draw some conclusions from it.

Sometimes a notch or indentation is seen just below either cusp. This notch or indentation seems to be nothing more than the polar collar. However, when it is seen in conjunction with the “horns” it can give the horns a “hooked” appearance.

Here are some observations of the polar collar. J. H. Schroter reported a hook-shaped southern cusp. This condition continued from 9 Mar 1790, until it disappeared on the 30th. Schroter’s southern “hook” lasted for an entire month! In 1876, Arcimis, the Spanish astronomer, observed a prominent notch in the southern cusp. On 29 Mar 1873, W. F. Denning observed an indentation near the northern cusp. It is somewhat unclear whether Denning observed a notch or a **depression**. It is probably more likely that he saw a depression. Some years later Denning reported that during the period 30 Mar to 5 Apr 1881, he saw a dusky indentation not far from the northern cusp. He referred to it as: “. . . **extremely small**, **and looks like a crater**.”

Did W. F. Denning see depressions on Venus on two occasions? The Venusian polar collar does often appear to be the rim of a hole. What interests me is what else made him think he was looking at a depression? I can only conclude that he must have seen some kind of shadow or shading which made him think a depression lay there. His description of it as a crater is quite stunning. This is indeed what we are looking for.

Although NASA images of the Venusian surface show no abnormal terrain in the Venusian polar regions. In the period 1881–95 a dusky band was noted around the southern cusp frequently at the Royal Observatory, Brussels. On 9 Mar 1889, a prominent notch was seen just below the southern cusp. It is reproduced in Figure 6.7.18 On 18 Apr 1900, dark indentations were seen by S. Bolton near both cusps.[19] Figure 6.8 is another drawing of the blunted southern cusp (top).

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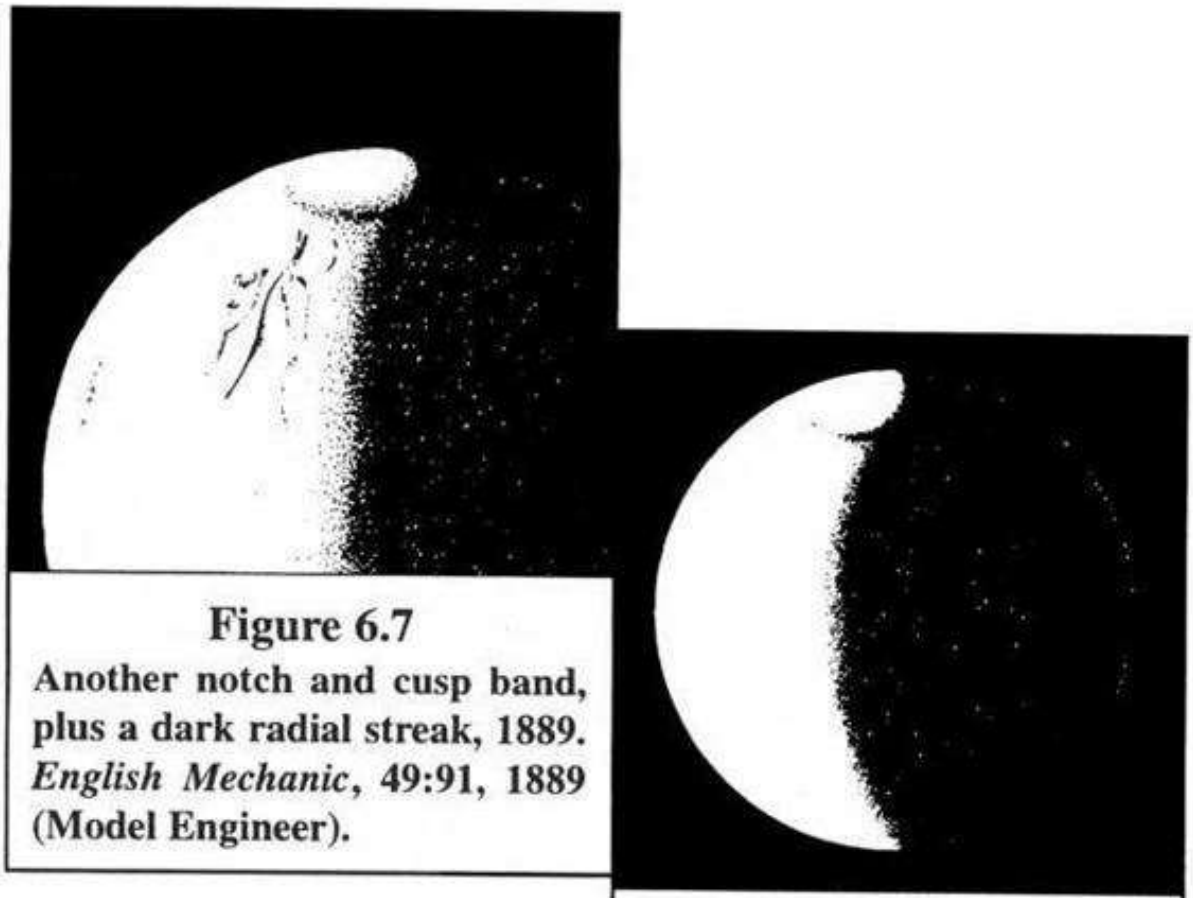

Figure 6.7
Another notch and cusp band, plus a dark radial streak, 1889. *English Mechanic*, 49:91, 1889 (Model Engineer).

Figure 6.8
Venus: 13 May 1900. Blunted southern cusp and notch.

Let us examine both Figure 6.7 and Figure 6.8. Based on some of the observations quoted above it would seem that the Venusian polar collar varies considerably. Often it is not visible from Earth. Yet we can see it very clearly in Plate 3.

In Figure 6.7 one can see the cusp is blunted (rounded) and there is a "notch" in it caused by the polar collar. The streaks moving away from the pole may be darker clouds, perhaps winds blowing to/from the pole?

In Figure 6.8 we can see a similar effect. The polar collar is partly responsible for the blunting effect. But why has the tip disappeared altogether? Sometimes astronomers have seen detached points of light at a distance from the blunted cusp. This might be part of the disappeared tip which is visible.

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In such cases, why does the entire area within the polar collar turn so dark that it cannot be seen? What if it has something to do with air blowing into or out of Venus? Could such winds raise dust which then obscures the entire Polar Hole? Could this be the cause of the blunting?

On 15 Feb 1913, F. Sargent, Bristol, England, discovered a pronounced notch just below the northern cusp. The appearance of the notch changed considerably during the next few days.

Could the notch and the polar collar be the product of a physical feature? It seems to always be located at a set distance from the cusp. Note its size in relation to the planet in both drawings above - done by different observers at different times. Note how the notch remains the same size in relation to the rest of the planet. Can this be the rim of a gigantic hole?

On the 23 Feb 1921 a dusky band was seen again. In 1963 Dale Cruikshank assessed the situation:

> . . . **6**. **Cusp bands**. **In addition to bright cusp caps**, **observers often report dusky bands or collars near the cusps which define or border the caps**. P. Moore, (*The Planet Venus*, 1st ed., Macmillan, 1958, p. 53) suggests that the bands are simple contrast effects of the bright cusps, saying that his own observations **'Indicate that the collars can only be seen when the caps are unusually prominent.' I suspect that many observers would disagree that they are seen only in the presence of bright cusps; I do**. **Because I have seen such dusky streaks with and without the adjacent bright cusp caps**, **I am led to believe that they are not different from the ordinary dusky bands which are often roughly perpendicular to the terminator**. At the apparent poles, however, these bands are highly foreshortened, and this accounts for the usually narrow and rather dark appearance. **This also may tell us why cusp bands or collars are often seen when no other features are visible** (see Figure 16, *Strolling Astronomer*, 16, 7–8, p. 179, 1962). Broad bands on the limit of visibility at the center of the disk will be darker and more easily visible near the poles, assuming that they are near the top of the visible portion of the atmosphere. **That the dark bands lie at such a level is consistent with the fact that they are most prominent in the bluest regions of the spectrum**.[20]

Patrick Moore, who disputes the existence of blunt cusps, has no problem

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seeing the polar collar. He notes that he can only see it when the polar caps are at their brightest. Moore therefore concludes that the collar is purely a contrast phenomenon. Cruikshank disputes this because he and many others can see the collar even when the polar caps are not bright. The Reader can see the polar collar easily in Plate 3, so it is definitely real.

Moore may be partially right, but for a totally different reason. He thinks that the collar is an optical illusion. Moore has a tendency to write off many phenomenon as contrast effects. The real problem may be more complicated than that. The collar might be more easily visible when the polar caps are bright, simply because the bright back-ground helps to highlight the dull area around the Polar Hole. Perhaps the bright cusps are back-lit by light from a central Sun? Perhaps this happens when the misty conditions inside the planet clear up a little and more light manages to reach the upper polar atmosphere? Perhaps the polar collar is also affected by winds blowing over the edge of the hole as well? Such winds may raise dust and one might only see this dust as it goes out over the rim of a hole. There may be more factors to consider than just merely contrast effects. There might be very logical meteorological phenomenon associated with this.

There may be other related phenomenon too. The rise and fall of the Venusian polar vortex might be highlighting the collar. If the Venusian atmosphere in the vicinity of the poles falls, it may be easier to see the rim of a hole. Of course one can only see the rim because in the middle of the depression there is nothing.

This may in part explain the results of Moore’s observations. Cruikshank disputes Moore’s views and states that many observers, including himself, can see that polar collar at any time. In Cruikshank’s paper he states that the Venusian polar collar is more prominent in blue light. Baum and Moore had a dispute over the reality of what Baum was seeing, so they both had their eyes tested. It was found that Moore’s eyesight is not as sensitive to blue light as that of Baum. This might explain why Moore does not see the polar collar as often as Cruikshank does. Moore’s own eyesight might explain why he tends to write this off as an illusion.

Cruikshank points out that the polar collar **borders on the bright polar caps**. This again establishes the physical link between these phenomena. The Polar caps may be bright when they are back-lit from inside the planet. Perhaps these winds also bear bright, luminous aerosols which are blown out from inside the planet? Perhaps this is why the belt may extend further

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equator-ward as NASA says?

Did W. F. Denning see a depression on Venus? Richard Baum wrote the following in 1973:

> A well-marked hemispherical depression was reported in the terminator below the southern cusp by several American and English observers during the first week of March 1953. Clearly seen on the evening of March 10 by the writer, it seemed bounded on its northern and southern flanks by dim projections and was preceded on the disk by an oval bright spot.
>
> 17 Dec 1970. A feature like that of 1953 seen by W. J. Wilson and R. Baum, when Venus was in the opposite phase.[21]

Here are among the most amazing series of sightings which have ever been recorded regarding Venus. None other than Baum informs us that several astronomers saw a depression in the same week in 1953. Baum himself saw it. And he saw it again on 17 Dec 1970. All these observers saw exactly the same thing which Denning saw in the last century.

Notice how the presence of a bright oval spot preceded the sightings. Is this bright spot caused by a concentration of disassociated atoms blowing out of the planet?

The Venusian clouds have a consistency akin to mist on Earth. Do the clouds extend all the way down into a Polar Hole? If so, are miles upon miles of such thick clouds able to mask the light from the Venusian Inner Sun? I would think so, especially since that light would have to travel from a central Sun through an atmosphere thousands of miles thick to the outer surface. Could the depression have formed some time after the luminous air was blown out? Was air then being sucked into Venus? If so, would that reduce the cloud cover's thickness such that the rim of the depression can be seen?

What causes the blunted cusps of Venus? My interest in Venus was to test the viability of Hollow Planet Theory. I thus went poking through astronomical anomalies looking for evidence of planetary holes. When I first saw drawings of the blunted cusps of Venus with the polar collars I immediately thought of planetary holes. The link seemed so clear. Remember, solid planets shouldn't have holes in them so these observations by highly trained and dedicated observers are nothing short of incredible. But

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what do astronomers think of blunted cusps?

I asked Dale Cruikshank. He replied by e-mail on 30 Oct 1997 as follows:

> 1. Blunted cusps of Venus and Mercury. This is purely an optical effect of the low contrast in the visual images of both Venus and Mercury. There are times when the polar regions of Venus are a bit darker (primarily when seen in ultraviolet wavelengths) than other parts of the disk, and this probably contributes to the apparent blunting of the cusps, particularly to observers whose eyes are somewhat sensitive in the blue and UV spectral regions. I have seen this myself, but I do not attribute it to anything unusual or mysterious. It is purely an optical effect and does not indicate anything particularly unusual (or diagnostic) happening on Venus. Similarly with Mercury, low contrast in the image can cause an apparent blunting of the cusps, and while this may be related to the distribution of relatively light and dark regions on the planet (as seen in Mariner images), this optical contrast effect does not in itself indicate that anything unusual or mysterious is happening on Mercury.

I asked Richard Baum what he thought. In his e-mail reply to me on 30 July 1996 he wrote:

> Asymmetry of the cusps of Venus in which one cusp appears sharp and tapered, the other blunt or truncated was first described by Schroter in December 1789. Verified by J H Maedler 1833 and 1836, J Breen 1853–4, and subsequently by others too numerous to mention. **If real**, **it must represent significant height differences in the polar cloud vortex**. However it is just as likely to arise from optical effects due to unequal brightness of the cusps. **Other anomalies include a hooked appearance to the cusps**, **and changes in curvature**.

Cruikshank states that there is nothing mysterious happening on Venus. Baum gives a conditional answer. He says “If real. . .” It seems as if Baum too, has considered that the blunted cusp may represent a curvature problem on Venus (i.e. a depression). Baum is convinced of the reality of the phenomenon. To him it is merely a question of whether this is (a) an optical effect or (b) a physical curvature problem. He seems to favor (a)—yet his answer has hints of having thoughts about (b).

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I did not want to anger my scientific correspondents. I was dying to ask them if we could be seeing a gigantic hole on Venus. Cruikshank's attitude showed that he would not consider ideas different to that advanced by science as it now stands. Baum's writings on the other hand strongly suggested that a few bizarre thoughts had gone through his head, especially his suggestion that the polar vortex might be falling thereby causing the blunted cusp.

Richard Baum is a very friendly and pleasant gentleman of high integrity. He seems to be very talented and open-minded. As with the Mercurian ice caps, I kept getting the feeling that he had some private suspicions of his own but that he was watching his words in public! He knew all along I was writing a book, so he was probably very careful regarding his replies. This is probably out of respect for his office. He does not wish to speculate wildly, even though, in my opinion, he has enough evidence to warrant it. I did try to ask him about depressions in the Venusian polar regions. I asked him more than once. I specifically asked about the incidents above, from 1953 and 1970. I asked for more detailed information. He never replied to the specific mention of depressions. So, very sadly, that is as far as I could go. These sightings in 1953 and 1970, along with Denning's own mention of seeing a "crater" at the Venusian pole, seemed to strongly hint at sightings of a gigantic hole.

I have a deep admiration for Richard Baum and for the British Astronomical Association. So I decided to let things go without pressing him more. He constantly suggests that astronomers study all these phenomena more closely. I feel we are definitely on the same side. We are searching for the truth. I support his call to the hilt. I really hope that this book will help to spur on other amateur and professional astronomers into looking more closely at these problems.

I realized long ago that before the debate about Hollow Planets could really begin, I would first have to present a "case." This book is the first presentation of that case. I would love to revisit the issue of depressions seen in the polar regions of Venus once scientists and astronomers have had a look at the ideas presented here.

Cruikshank nowadays relegates the phenomena to a common cause. In the chapter on Mercury I have already voiced my opinion that I think he is ignoring some of the evidence. I think he is making the same mistake with Venus.

With regard to Venus, the entire phenomenon is very complex. As the

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Reader must now appreciate, Venus is a complex planet. There may be all manner of phenomena working together to change the planet's appearance and to confuse us. We have the ashen light and we have a highly refractive atmosphere. Is Venus luminous from inside? Are there winds causing dust storms? Does wind flow into and out of the planet? Is the polar collar the rim of a hole? Is it caused by winds perhaps flowing over the rim of a hole? Does the misty air clear from time to time allowing a central Sun to add to the optical affects in and around the polar caps?

The depression which Denning, Baum and many others have seen over the past century may be related to the blunted cusps. These phenomena seem to be very rare. It may be a long time before a satellite captures a close-up image of it. Satellites take still photos at certain intervals, and satellites are not always present in the vicinity of the planets. It is often years, and even decades between some of these sightings, so it may be a long wait before a satellite photographs this phenomena close-up. Perhaps space telescopes and/or a new generation of high resolution ground telescopes will be the answer?

On the other hand, the ashen light of Venus was once considered a very rare phenomenon. But now, after more study, it is seen much more often. The same might be true for these other phenomena. Perhaps once attention is drawn to them astronomers will take more note and soon the sightings will be rolling in.

What if the depressions which astronomers saw on Venus are real? What if they really saw depressions in the Venusian clouds? Why do I think that there may be a hole underneath? Let us compare the planet to an orange. Imagine the skin of the orange to be its "atmosphere." The Earth is 7,926 mi in diameter. 99% of its atmosphere is contained in the first 30 mi of atmosphere. Now let us scale this down to an orange 7 cm (70 mm) in diameter. Its atmosphere would then be 0.26 mm thick. The Earth's aurora occurs at tremendous heights where there is almost no atmosphere. The Earth's aurora on such a little model would be about 0.42 mm above the surface of the orange. An orange has a rougher surface than a planet. The Reader should now appreciate how extremely thin a planet's atmosphere is. The Venusian atmosphere is not much thicker than the Earth's. The planet's atmosphere is akin to a thin "skin" covering the rocky surface. Any depressions in that skin could never be observed from the Earth. Telescopes do not have that sort of resolving power to see indentations so small. Nor

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could such depressions in the atmosphere dent or deform the planet's shape in any way whatsoever. 30, 50 or 70 mi is utterly insignificant on a planet 7,700 miles in diameter. If such massive depressions exist then it can only be because the underlying crust is itself deformed. Baum said that if the blunted cusp effect were real it surely indicates a tremendous drop in the height of the polar vortex. And yet, if one looks at those drawings one cannot help but doubt his reasoning. One is seeing something so enormous—something far greater than a mere 30 or 50 mi. One can only be seeing an enormous dent in the crust of the planet itself. In order to see something this enormous, and to have the effect which it does can only mean one thing: the surface of the planet has a dent in it hundreds of miles in depth. Such a dent would be the deepest crater or hole in the crust of any planet we know.

But does a dent on this scale imply a hole stretching all the way through to the core of the planet? Not necessarily. However, as we dig further into Venusian atmospheric issues I will be presenting the case for an Inner and Outer atmosphere—connected by gigantic tunnels and the resultant effects on the planet's meteorology. The first indication that these holes led into the core of the planet is evidenced by the possible light which shines out of the interior of the planet. But more evidence will be brought forth in support of this argument. There seems to me to be ample testimony that something very strange is happening on Venus. I think astronomers should take a much closer look at the polar regions of that planet.

Let us concentrate more closely on the Venusian polar features. Astronomers have also seen streaks in the vicinity of the Venusian poles. Thinking these might be permanent or semi-permanent features attempts were made to deduce the rate of the planet's rotation.

Quite a controversy arose between several astronomers in the 1950s when Richard Baum drew "radial spokes" emanating from the Venusian equator. Baum believed these streaks were due to columns of hot air rising. The radial streaks are of minor interest to us here. What Baum also drew was a very prominent polar collar which he believed might be a permanent feature.

During this controversy there was much discussion about eyesight and the resolving power of large and small telescopes. Most people are aware of Professor Lowell's "Martian canals." It has been blamed on bad optics in his telescope. Yet his telescope was of a high quality. The Martian canals have been seen by other observers even in this century. The secret to seeing the

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Martian canals has to do with telescope aperture. Lowell noticed that if he stopped his telescope down from 24” to 18” he would then see these clear streaks on Mars. If the telescope is stopped down to less than 15” the canals would once again disappear. The Martian canals are thus the product of telescopes of 15”–24” in aperture. J. Worthington noted that for the best effect a telescope must be stopped down to 18” and a magnification of 300 must be used. Antoniadi, using the 33” Meudon telescope was not able to see the clear Martian canals. But what he did see was diffuse markings in the places where the canals were. He was thus able to state that the canals did not really exist, but were caused by the loss of resolving power caused by stopping down the telescope. J. Worthington did once see the canals in a 40–inch telescope using a magnification of 700. He said the images were unsteady and they had a tendency to disappear. Prof. G. W. Ritchey was unable to see the canals with the 60” telescope at Mount Wilson.

Many astronomers have stated that smaller telescopes seem to show features more sharply than larger telescopes. Various explanations were developed to explain why this should be so. The radial spokes on Venus which Baum saw might have been a product of Baum’s use of small telescopes. The radial spokes are not seen on satellite images; although they do appear on some UV telescope photographs. A further consideration is that Baum seems to have exceptionally keen eyesight in the blue end of the spectrum. Baum also saw the Venusian polar collar which so many others have seen. And it is really the polar collar, and his conclusions about it which are of interest to us. Dr. Bartlett wrote the following about Percival Lowell:

> Lowell divided the Venusian markings into various classes, among which he particularly mentioned ‘nicks’ in the terminator and **‘the collar around the South Pole’**. **Terminator indentations**, **of course**, **are old stories; but in the ‘collar’ we immediately recognize a feature familiar to every acute A.L.P.O. observer of Venus**. **Lowell’s ‘collar’ is simply the dark cusp band usually found as the northern border of the bright south cusp cap**, **which may indeed mark the actual South Pole**. **Lowell evidently was quite satisfied that it did**. . . **Moreover the cusp band is frequently reported by observers who fail to see anything else on the disc**. **We seem forced to admit that when Lowell described his ‘collar’**, **that**, **at least**, **was not an illusion but an objective reality which remains visible today**. Associated also

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with the ‘collar’ were two dusky spots, which Lowell called Astoreth and Ashera, like large dark beads strung upon the narrow line of the cusp band. These too have been seen in our times. **So too have the ‘notches’ which Lowell described at both cusps**. The general picture of Venus which Lowell gave us in the [18]90s is one that is easily recognized today by every close student of the planet, including those who have never heard of his Venusian work.

. . . In 1899 Schiaparelli recorded a long streak beginning at the south cusp band, which he used to measure the rotation, and streak markings were recorded by Phocas in 1939–45. (*Author’s note*: The streaks which originate from the poles might be caused by air currents coming from inside Inner Venus. Since the polar vortex itself is rotating, the streak would rotate with it too. This is how Schiaparelli and many others made erroneous determinations of the rotation of Venus).

. . . But there is one modern observer whose work deserves special mention. . . Mr. Richard M. Baum, the very gifted English observer, not only sees a wealth of streak detail on Venus but he sees it essentially as Lowell saw it. (See Figure 6.9.)

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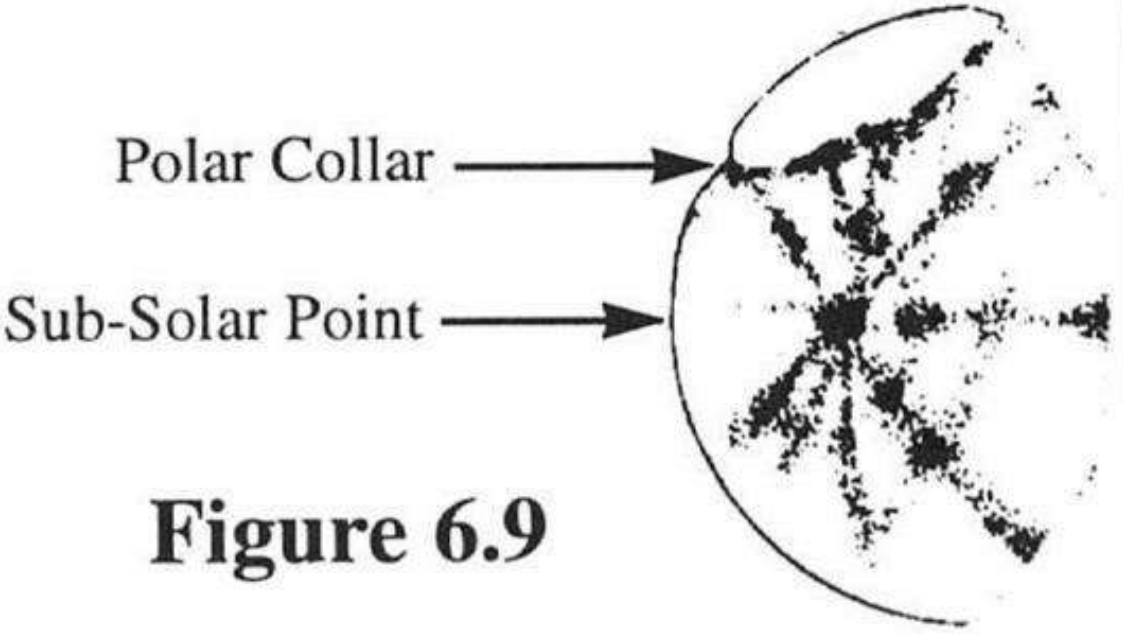

Figure 6.9

Radial Spokes drawn by R.M. Baum, April 26, 1951. (Bartlett, James C., Jr.; "The Radial Markings of Venus and Their Modern Resurrection," *Strolling Astronomer*, 9:2-8, 1955.)

At any rate both March and April proved so favorable that he was able to keep the system in view for 61 days and on all occasions when the streaks were well seen he found them to possess a faint color, a sort of yellowish gray. . .

From a close study of these surprising features Baum drew certain conclusions. **The observed spots**, **especially the straight streaks**, **are**

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> **not superficial but permanent features as are certain polar features**, **notably the dark band around the southern cusp cap**. (Baum, like Lowell, regards the south cusp cap as marking the actual pole); and from his study of the streak system he considered that the rotation is very slow. . . He further considered that the central spot from which the streaks radiated represents 'an enormous column of hot air' rising from the sub-solar point and drawing into it currents of colder air from all quarters of the disc, thus agreeing with the conclusions reached by Lowell. . . **R**. **M**. **Baum is an indefatigable observer and a fine draughtsman**. Reading his report of the streak system one cannot doubt that here is a simple record of what was actually seen, yet it has to be admitted that other equally careful and experienced observers, e.g. Patrick Moore, have never been able to see the slightest indication of such a system. The present writer occupies a median position, having seen enough of the system to be convinced that pronounced linear markings do exist on Venus; but having seen it so imperfectly as to be quite unable to define the whole.
>
> A little study of the work of various observers indicates that with respect to Venus they tend to fall naturally into two groups. In the one group is found preeminently R. M. Baum who sees the markings principally as a system of streaks, while in the other are those who see them always as large, diffuse, dusky areas. Between the two are those who partake of the characteristics of both, seeing sometimes linear markings, sometimes diffuse spots and sometimes both in association. To the latter category belong O. C. Ranck, D. P. Aviliano and the writer. **The author believes that the solution to this mystery lies in the different color sensitivities of the different observers**.[22]

Patrick Moore, another famous English astronomer and friend of Baum, responded to the preceding article, maintaining that the spokes must be rejected as illusory because only a few observers can see them. Again, the spokes are of minor interest to us. Moore's comments on Baum's abilities are interesting and wrote:

> . . . I know Baum to be a splendid observer and a magnificent draftsman, and as he is also a very old friend of mine I feel I can say what I like!

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> **We have collaborated in lunar work**, **and aperture for aperture he invariably sees more than I do**, **quite apart from his infinitely greater skill at recording detail**. The one object upon which we disagree is Venus. He sees a radial spoke system; I cannot.
>
> The strange thing is that Baum has recorded the spokes with a 3–inch refractor, which is considerably smaller than the finder on the Lick telescope used by Barnard. Mr. Ranck's refractor is precisely the same size as this finder. I have used various telescopes up to and including a 15.25–inch reflector, but most of my work has been done with my own 12.5–inch reflector. My greater telescopic aperture must inevitably compensate for Baum's superior skill as an observer, but my only reason for mentioning my work is to point to a simple but significant experiment.
>
> **It is often said that a small telescope will show more on Venus than a large one**, **because of the reduced glare**. This seems to me to be a complete fallacy (provided that Venus is observed against a light sky, of course). I have a 3–inch refractor of my own, and on a number of occasions I have drawn Venus with it before turning to my 12.5–inch. Invariably I see more with the larger telescope, but the markings appear more diffuse. The small aperture naturally sharpens them up, simply because of the lack of resolving power. . .
>
> **I do not dispute that some 'streaky' features may exist**, **and some photographs support this**. **Differences in eyesight may also play a part**, **and a simple experiment once conducted by Baum and myself showed that his eyes are much more sensitive than mine with regard to short wave-lengths**.[23]

I asked Baum for his views regarding the use of small apertures. In an e-mail dated 3rd May 1998 he replied: "There can be no doubt that in the hands of some observers small apertures will perform grandly. Gruithuisen definitely saw the polar hoods of Venus in 1813 and he used mere spy glasses. **Yet his descriptions of the phenomena are accurate**.

> Two words are important in considering astronomical investigations. One is observation, the other inference. Now if the former is accurately

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made and exhibits no bias you have a piece of data— a piece of a jigsaw. It is real, tangible, and in its way meaningful. No amount of tampering is going to change it. However when we consider inference we consider something of the mind. It is therefore subjective. **In large measure this is the basis of the old philosophy where observation was sacrosanct**. Yet, and this was the substance of my 1973 book *The Planets: Some Myths and Realities* can we be absolutely certain of observations? **There is enough evidence in the archive to tell us we cannot**. In 1846 and for six years thereafter William Lassell believed Neptune was surrounded by a ring. Now we know it is. That does not mean to say Lassell was right. In fact his observation was symptomatic of instrumental fault.

Jonckheere was prevailed upon not to publish his observation of an exterior ring of Saturn back during the early years of the century. I am happy he disclosed this by letter shortly before he died. His observation almost certainly refers to rings exterior to Ring A imaged by
.

In my discussions with Baum it became apparent that he believes that good, solid, observational evidence is more important than theory. I second that. As he admits above, some observations turned out to be amazingly right while others turned out to be wrong. But the instances cited by him above are mostly of individuals who came to right or wrong conclusions by themselves. The evidence I am presenting in this book often comes from multiple sources and continues to remain valid over long periods of time so I think it has greater merit.

Back in 1955 Baum replied to the above critique by Moore, defending the Venusian spoke system as an objective entity. He also added two pertinent bits of data:

1. Ultraviolet photographs of Venus taken in 1927 with the 60–inch Mt. Wilson reflector revealed bands slightly convergent on the subsolar point. These streaks had much in common with the streaks drawn by Schiaparelli, Lowell, and many others.

2. In 1953 Moore and Baum had their eyes tested for color sensitivity. Baum was able to see farther into the blue end of the spectrum than

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Moore.[24]

Cruikshank reviewed the Baum–Moore controversy, and continued as follows:

> A. Dollfus has made important planetary observations under optimum conditions with large apertures in recent years. He reports that the dusky markings on Venus generally have the pattern of a radial system with the center at the subsolar point. Dollfus finds that the general appearance of the markings varies greatly from day to day but that the radial pattern or portions of it recur and that this represents the undisturbed condition of the markings observed. He offers a general map of the planet showing these permanent features. In many respects, this pattern reported by Dollfus is consistent with a model of the circulation of the Venus atmosphere proposed by Yale Mintz. The Mintz model is based on convection in the planet's atmosphere (assuming a very slow rotation) with the principal circulation from the subsolar to the antisolar point.[25]

Although the radial spokes are not seen on satellite photos, there nevertheless seems to be interesting evidence that perhaps they are the product of some kind of atmospheric circulation pattern. Baum thought that they were produced by the Sun heating the "midday" (sub-solar) point on Venus. The work of A. Dollfus and others seems to suggest that there may be something in Baum's ideas. In an e-mail to me dated 3 May 1998, Baum explained the UV mystery in greater detail:

> That some observers appear able to see markings on Venus analogous to those imaged in UV is reasonably well established. The question is: is it simply coincidence compounded by the illusion producing luster of Venus? The problem will not be solved until we get simultaneous visual and UV observations.
>
> Now the debate Moore and I had in the 1950s stemmed from my sighting of markings akin to those first registered by Percival Lowell in 1896. I refer to the hub and spoke system, or the cartwheel effect, which attracted such universal reprobation. Actually such a pattern of markings is theoretically possible. **A massive uprush of air at the subsolar point and a descent towards the poles**. **This is how Lowell interpreted his**

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> **markings**. **All hinges on whether the spoke system is real or illusory**. **French astronomers including Dollfus reobserved it during the period 1930 to 1953**. **There does seem to be some evidence in support of its objectivity (Yale–Mintz)**.
>
> It was as a result of my sightings that Moore and I took part in a UV test in 1953. This was conducted by a physicist of the then British Atomic Energy authority. Moore briefly mentions it as a footnote on page 57 of his *The Planets* (1955). However that was penned before he knew the results. Colin Reid the man who masterminded the experiment was not able to calibrate the measures until early 1954. **The result was interesting as Moore has no UV perception**. **I had the greatest reach**, **Reid himself slightly less**. On the evening the results were disclosed Moore was visiting. Venus was an evening star and the three of us i.e. Moore, Reid and myself each independently drew the planet as it appeared to us through Reid's 9–inch Newtonian reflector. Later we compared notes. **I had seen part of the spoke system**. **Reid partially verified my observation**, **Moore saw nothing except an amorphous grey shading**. Read what you like into that but it holds something to think about, hence the article "Venus—a mystery unresolved.

It is clear from the above that UV perception varies from person to person. A key fact I would like the Reader to remember is that these radial spokes suggest a strong movement of air from the equator to the poles. This will help us in attempting to resolve some of these Venusian mysteries. In an e-mail to me dated 10 May 1998, Baum wrote:

> The radial spokes of Venus are a mystery. Lowell himself admitted to the possibility of their falsity in 1902, but within a year retracted the confession, and in 1914, two years before his death, affirmed their reality, announcing his completion of their study. What emerges as interesting are the observations by Jacques Camus who in the interval 1930–2 charted a system analogous to the Lowellian 'cartwheel.' The difference being that whereas Lowell did not place the hub at the subsolar point, Camus did, and that too is the essence of the system mapped by Dollfus (1948–53) from visual and photographic studies. **Some years ago a NASA investigator**, **Goldstein published a**

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> **technical study on the thermosphere of Venus**. **He added an appendix suggesting that there might be some evidence from his study of wind spheres to substantiate the existence of a pattern of markings radiating from the subsolar point**.

After all that background material, let us now return to the polar collar. Dr. Bartlett stated that every serious student of Venus knew of the existence of this polar collar, and that it was normally referred to as a cusp band. It was normally seen around the South Pole of Venus.

Baum concluded that the polar collar was a physical feature—as did Lowell. What if the Venusian polar collars are produced by air moving in and out of the Venusian Polar Holes and that we are seeing a direct indication of the location of the rim of the Polar Holes?

Now that satellites have photographed Venus we know that what Baum and Lowell saw is real. Astronomers did note, prior to the existence of space probes, that Venus was not perfectly white in appearance. Various dark markings did come and go. Such dark markings are apparent on almost all satellite photographs. Scientists have also determined that the Venusian atmosphere is thickest in the polar regions.

Since the polar collar lies at the same latitude and remains in the same position, it might be the result of a physical feature. The Venusian atmosphere possibly rises and falls (as will be discussed later on), and hence this polar collar may become more visible when the atmosphere falls in height. If winds blow into and out of Venus, it may be possible that dust storms add to the collar's darkening.

It is hard to determine whether the collar is the rim of a hole which we are seeing directly, or whether it is caused by turbulence from air going into and out of a hole. But either way, the polar collar does lead to the suggestion that we are seeing a physical hole beneath the polar clouds.

THE HUMAN FACTOR

Earlier I raised the issue of telescope and eyesight problems. In earlier years, before the invention of the camera, astronomers were always forced to draw everything they saw. Being a fine draughtsman was a definite benefit. As a teenager, I tried my hand at drawing maps of the Moon, or of interesting features on it as seen through my little telescope. I can well appreciate the

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considerable patience and effort which goes into it. It is an extremely difficult and time-consuming task trying to get the proportions and coloring just right. As for the drawings of Venus by Baum and others, I can only say I never even saw the polar collar! But then I never said I was much of an amateur astronomer, nor did I devote the time which serious amateurs do to this hobby. Others have more patience, and far more ability than I. It is indeed marvelous to see and discuss the fascinating results of their hours of quiet dedication.

Telescopes do not give one “instant gratification” like photographs from space telescopes and satellite probes. There is a great deal of fine skill which goes into obtaining results from a telescope of any kind. The level of detail one sees is much less than these modern-day satellite probes. However, the telescope user has one advantage over NASA. He can turn his telescope to any planet which is in the sky and watch it for as many hours as he has the patience. This enables these observers to see things on those worlds which one cannot appreciate merely from still photos. They are able to see these dynamic worlds through all their seasons and to watch happenings on their surface in “real time.” This is valuable information.

The astronomers of today do not sit by a telescope all night long watching the planets. They make use of cameras and point them to the various objects of interest. They have various carefully calculated exposure times for the photographs which they wish to take. Professional astronomers today do not spend hours upon hours drawing what they see. This sort of thing is still the preserve of amateurs. Perhaps some of these astronomers are missing out on things which were more familiar to the classic observers?

Astronomers also believe that cameras are “objective” while humans are “subjective” and thus not as reliable. This is only part of the picture. Some humans may be able to take their instruments further and to obtain more from them than others. The skill factor should not be ignored. Plus, some people may have more acute eyesight and may be glimpsing some very important happenings. Medical journals have many instances of remarkable eyesight. Is Richard Baum such a highly gifted individual? Maybe. There are some people who can see Venus in broad daylight. Most of us cannot. I believe that a telescope is not all that much different from a bicycle, shovel or any other tool. The user’s fitness and skill definitely play a role in how well this tool will serve him. Our brain devotes a great deal of processing power to analyzing what our eyes see. Perhaps this is what causes some of the

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"subjectivity" which bothers some scientists. Perhaps some brains are better adapted to dealing with visual input?

You might think that a camera's objectivity is preferable to a visual observer's subjectivity. But the problem is more complex than that. The human eye can see more through a telescope than a camera attached to the same telescope.

The Earth's atmosphere always has dust in it. There are also temperature differences at various heights. Even though most observatories are situated high up in the purest air, they are still dogged by the Earth's atmosphere which mangles the incoming light waves. Astronomers thus always refer to the "seeing." Cloudy, misty, conditions or atmospheric turbulence may make images unsteady and make them dance about in the telescope. Seeing varies greatly. When one is pushing one's eyesight to the limit and trying to observe the finest detail which the eye will allow seeing becomes very important.

Since the light we receive from stars and planets is so terribly weak one is forced to use long exposure rates when taking photographs. During these long times the seeing may vary and so the photograph shows us an "average" picture of the planet. The very finest detail will always be lost.

The human eye/brain combination is a much finer tool. The human brain can remember something seen for a split-second. The human observer can then record it in a drawing. He can wait for many minutes, or even hours, for better seeing and again catch a glimpse of the faintest and finest of detail.

Perhaps one day we can develop computer controlled telescopes which can mimic this and thus only pick out the finest detail over long periods of time? I don't see why not. I discussed the problem with Brian Sutin of Lick Observatory. In an e-mail to me on 6 Jan 1997 he wrote:

> The effect causing all of the confusion is called 'seeing', which are disturbances caused by the atmosphere. This phenomenon has become almost completely understood (at least, in effect) in the last few years.
>
> The atmosphere causes the view of a star (or whatever) to be bent around by the different temperatures and densities, so that **a larger aperture telescope catches more different views from different directions**. **This looks like a blur**. **A smaller telescope will catch fewer patches**, **and thus appear clearer**. 'Adaptive Optics' is the new field of trying to reassemble these patches afterwards, often from

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observing a laser sent up into the atmosphere and then mangled on the way back down.

The reason that the human eye can often see resolution much better than photography is that the view through the telescope is often blurry, but every once in a while the view will suddenly clear for a split second, and the brain will remember the image it saw. This has been tried successfully by astronomers (at the University of Hawaii, for instance) by using a shutter which only opens when the image settles. Unfortunately, the shutter is rarely open, loosing most of the light.

I tried to find photographs of the Venusian blunted cusp, but could find none worth putting in this book. Richard Baum told me that Dr. Don Parker had successfully imaged the blunted cusps of Venus. I contacted Dr. Parker and he sent me some images but they were disappointing. One could see nothing of interest.

Thus much of the phenomena mentioned in these chapters are seen by students of Venus and Mercury, but have never been photographed by earth-bound telescopes. Maybe the Hubble telescope will have more luck? Perhaps with the next generation of space and ground-based telescopes it is just a matter of time before these Venusian phenomenon will be recorded and studied properly. Nevertheless, thousands of drawings of these phenomena already exist. ALPO, (Association of Lunar and Planetary Observers) is one place to start looking.

Some of the classic observers spent virtually their entire professional careers in front of the telescope. They had finely honed telescopic skills and were able to see amazing things.

Everyone has heard of the magnificent rings of Saturn. It was only in the 1980s that American probes showed that Jupiter had a very faint ring around it. Thus NASA knocked up another first, or so everyone thought. Yet, perhaps a Russian astronomer, Dr. Vsessviatsky really deserves the credit as the discoverer of the rings of Jupiter. He may have been decades ahead of everyone. In an article in *Science*, on 1 July 1932, he contended that short period comets owed their origins to Jupiter. He was actually echoing the views of Richard Proctor, an English astronomer of many years earlier. Over the years Dr. Vsessviatsky carefully accumulated more and more evidence.

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Then in the early 1960s, Dr. Vsessviatsky stated that there might be debris forming a ring around Jupiter. The ring was too faint to be seen directly with a telescope. So he presented various astronomical evidence (e.g. occultation of stars) to show that there was an extremely faint ring around Jupiter. Nobody believed this. His carefully presented arguments never gained favour. Yet strangely enough, more than 20 years later, Voyager presented us with the first images to show that indeed Jupiter has a ring around it.

This is a spectacular example of how much one can get out of a simple tool like the telescope if one applies one's mind to a problem. Being in the computer industry I am quite familiar with the many, varied, and spectacular applications and gadgets which are invented all the time. There almost seems to be no limit to what electronic gadgets can do for you. However, even so, I have something of an old-fashioned attitude towards all this gimmickery. We must never lose sight of the fact that space probes, computers, and Hubble telescopes are merely tools. They are no different from a garden spade. The spade can do nothing for you by itself. It won't tell you where to dig. You still have to use your brain and your intellect. Many high-tech tools are extremely limited in the questions they can answer. Remember the Viking probes on Mars which had to tell us whether there was life on Mars or not? Remember how they could only do the experiments which were devised? Then afterwards, there were debates as to what exactly these results meant, if anything?

All these gadgets are fancy, make no mistake, and many are absolute marvels of engineering. However, we still need to do the deeper thinking and analysis of what these things are telling us. There's no probe out there which is going to suddenly send us a binary message saying "Newton's Law of Gravity is flawed!" No such luck. Remember that with all these fancy tools it is still a case of garbage in, garbage out. No matter how fancy our technology becomes, our own intellectual abilities and our own ability to analyze the unknown can never be replaced. Whenever we stand on the edge of the great unknown we will have no tools which will give us the answers beforehand. The only tool which is flexible enough to deal with the unknown will be our minds. Your mind is your ultimate survival tool.

Long before space probes, astronomers did not believe that there were craters on Mars. The American, E. E. Barnard was a very well respected professional astronomer. During moments of excellent seeing, he caught glimpses of craters on Mars. However he never dared say so in public for fear

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of ruining his reputation. Barnard saw his first Martian craters from Lick observatory in the early 1890s. J. Mellish saw his from Yerkes in 1915. Mellish, being an amateur, had no problem lecturing and writing about his anomalous observations for many years. But no one believed him because his observations did not coincide with the reigning paradigms of the time. It was only once space probes had been to Mars that scientists remembered what Mellish had said so many years ago.

This is one of my reasons for writing this book. I have a suspicion that there are a myriad of other mysterious sightings and observations which astronomers may be too reticent to talk about for fear of having their reputations tarnished. Or perhaps they are seeing phenomena so incredible that they regard them as optical illusions. Many of these sightings which I mention here might actually be more common than we think, but everyone is so busy denying and doubting their existence that nothing ever gets done about it. There may be anomalous telescopic sightings, and anomalous experiments which point to the existence of Hollow Planets. However, since no one thinks seriously about Hollow Planets (or even knows what to expect), these bizarre results may be swept under the carpet in a paradigm-induced myopia which makes us see only that which we want to see. And yes, it may literally be a case of seeing what we want to see! Anomalous results are often written off and ignored, or simply explained away. But what if such results are pointing us to something radically different from what we expect?

The story of Barnard and Mellish may be very relevant. On 18 Jan 1935 Mellish wrote a letter to Walter Leight:

> There is something wonderful about Mars. It is not flat, but has many craters and cracks. I saw a lot of the craters and mountains one morning with the 40” (Yerkes refractor) and could hardly believe my eyes. That was after sunrise and Mars was high in a splendid sky. I used a power of 750 and after seeing all the wonders, I went to Barnard and showed him my drawings, and told him what I had seen. I had never heard of any such thing having been seen, and he laughed and told me he would show me his drawings made at Lick in 1892–3. He showed me the most wonderful drawings that were ever made of Mars. The mountain ranges and peaks and craters and other things, both dark and light, that no one knows what they were. I was thunderstruck and asked him why he had never published these. **He (Barnard) said**, **no one would believe him**

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and (others) would only make fun of it. . .[26]

I wonder what depressions, lights and other marvelous things have been seen on Venus and other planets, things which seem to defy physics itself, things which scientists keep to themselves from fear of being laughed at. Or perhaps they miss most of it because they spend most of their time examining still photos? I wonder what other strange results have been obtained by serious scientists as they try to probe the secrets of our planet and other planets. I suspect that there is more information of a bizarre nature than we may suspect. Perhaps it's time to talk about these things?

THE VENUSIAN INNER SUN

In 1963 the American space probe Mariner II found that Venus had a negligibly small magnetic field. The values obtained for the interplanetary magnetic field tallied with those made by Pioneer V in 1960. Mariner II found at its closest approach to Venus (21,594 mi) that there was no significant change in the interplanetary field greater than five gammas. One gamma is a about a fifty-thousandth of the value of the surface field at the Earth's poles.

This seems to be in line with the current "dynamo theory." Even though Venus is virtually the same size as the Earth, it has an almost non-existent magnetic field. At first glance the "dynamo theory" would seem to be vindicated because Venus rotates so very slowly. Venus also does not seem to possess an aurora like other planets such as the Earth and Jupiter.

Yet before probes were sent to Mercury and Venus scientists had expected to find that Mercury would have no magnetic field, while Venus would have an appreciably strong one. This was the result of all their studies of the Earth, and their understanding of the mysterious "dynamo" which exists inside the Earth. The reality turned out to be exactly the opposite. Mercury had an intrinsic magnetic field while Venus had virtually none.

In 1955, J. Houtgast of Utrecht had estimated that the Venusian magnetic field should be five times as strong as the Earth's. He had studied magnetic records for the Earth from 1884–1953 and found that there was a marked drop in terrestrial magnetic activity whenever Venus passed between the Earth and the Sun. He theorized that Venus acted as a magnetic shield. He deduced that Venus had an enormous magnetosphere which was shielding the

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Earth from the solar wind.[27]

But where was the magnetic field which Houtgast thought he had found? There is a magnetic field around Venus. It is induced by interactions with the solar wind from the Sun. But what the space probes never found is an intrinsic magnetic field—one which is generated by a dynamo from inside the planet.

Venus is virtually the same size as the Earth. Even if it spins as slowly as it does, it should still have an intrinsic magnetic field which is much stronger than the one detected.

In 1983, Richard Fimmel raised this issue again:

> One of the principal unsolved problems of geophysics is the nature of the source of the terrestrial dynamo that generates the magnetic field of the Earth.

He went on to explain his concerns with regard to Venus. It had long been thought there was a relationship between the rate of spin of a planet and its resultant magnetic field. Since Venus is thought to be Earth's "sister" planet in many respects, it had been supposed that its dynamo mechanism must be similar too. Venus spins slowly, taking 243 Earth days to spin once about its axis. Fimmel points out that current dynamo theories are having difficulty predicting the lack of an intrinsic Venusian magnetic field. Even though Venus spins as slowly as it does, these theories still predict a magnetic field which should be easily detectable. But there is none. Fimmel writes:

> Other factors must be at work. A planetary magnetic dynamo requires a highly electrical conducting fluid core. The absence of a conducting core may explain why Earth's satellite, Moon, does not have a magnetic field, **but it does not explain the absence of a field on Venus**. **Under the temperature and pressures present in the core of Venus there should be a highly conducting fluid**.[28]

Note how Fimmel mentions the presence of a highly conducting fluid in the core, and the electrical nature of the core. These issues may relate to the strength of gravity deep inside a planet which I mentioned in an earlier chapter.

Note how Fimmel refers to the dynamo as one of the "unsolved mysteries of geophysics." Yet when pressed, scientists will always defend the

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convection-current-in-the-liquid-core concept. It seems to me that our science has reached a dead-end, a certain point beyond which it cannot go because it lacks the necessary theoretical concepts. The dynamo is a challenge which scientists cannot explain by appealing to physics as it stands to this day. They keep falling back on the same old ideas because they really have nothing else to work with.

So why not a “nuclear furnace” or a “nuclear star” at the center of a planet? In a later chapter we will discuss all the problems and issues relating to having a “nuclear star” inside a planet. It is a strange idea indeed. I wonder what Halley, Euler or Leslie would have thought of it?

Halley, having been the first to investigate the problem of terrestrial magnetism suggested that multiple permanently magnetized shells, rotating at different speeds, might account for terrestrial magnetism. That was a pretty ingenious idea 300 years ago. Sir John Leslie thought that two small binary stars might exist inside the Earth.

However, since the advent of nuclear energy, no one has taken Leslie’s idea further and explored the possibility that naturally occurring nuclear reactions might be the norm inside planets. What if some kind of nuclear reaction, like a fission process for example, were to occur at the center of a planet? What if heavy materials, such as uranium occur in greater abundance at greater depths? What if water, electric currents and different gravity affect the process and produce different results? Instead of such a reaction just causing a planet to explode outright, perhaps, like our Sun, there is a way for the energy release to be constant and controlled? What if the odd planet did explode when conditions were not quite right? That is a theme I hope to examine in a later book, because perhaps that is what caused the asteroid belt between Mars and Jupiter. Dr. Van Flandern whom I mentioned earlier, studied satellite explosions and killer satellites during his work for the U.S. Navy and his ideas in this regard are very impressive. What even he lacked is the necessary motive force to explain why a planet should explode. A few maverick geologists have supposed that planets, including the Earth might expand. But like Van Flandern they have no workable mechanism with the necessary energy to explain it. The concept of Hollow Planets may provide the answer. Perhaps there are nuclear reactions inside planets? During their early formation some planets may be veritable ticking time bombs.

The Sun undergoes magnetic field reversals every 11 years. The Earth also undergoes such reversals, supposedly every few million years. In 1963,

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in the *New Scientist* (17:10), it was suggested that perhaps Venus happens to be undergoing a magnetic field reversal and perhaps that is why no magnetic field was detected. The chance of there being a magnetic reversal just during the years that space probes were at Venus is of course unlikely. Nevertheless, perhaps something funny is going on inside Venus.

The idea that planets undergo magnetic reversals just like stars do is itself an interesting hint that perhaps there are small stars inside some or all planets. If it looks like a duck, quacks like a duck—maybe it is a duck? Maybe there are little stars inside planets? Where does all the excess heat come from which Venus produces? Did Venus undergo a melt-down in "recent" geological history? Is that why Venus is so extremely hot?

Take note that in spite of all this excess heat, there is still no evidence for a molten core which would produce the necessary dynamo action and result in a significant magnetic field.

Did Venus indeed have a strong magnetic field between 1884–1953 which then disappeared by 1960 and 1963 when the probes arrived? Of course the effects seen in the 1950s might be the result of the induced magnetic field.

One of the many surprising features of the mysterious "dynamo" is the extreme rapidity with which the magnetic field of Earth changes. For a magnetic field which is purportedly generated by convection currents, it behaves with a rapidity which is stunning. It is not entirely impossible that the Venusian magnetic field may have undergone a rapid change. I think it is unlikely.

How long does a "magnetic reversal" take? We do not know. The behavior of the Earth suggests that the magnetic field decays, changes direction and then slowly increases again. This may take thousands of years. Studies of the Earth's "dynamo" suggest that various "cells" of positive and negative charges cancel each other out thereby creating this "null" magnetic field. A similar process inside Venus may well explain why Venus does not appear to have a magnetic field at the moment. In other words, Venus may well have a powerful Inner Sun, but its positive and negative charges cancel each other out and one is thus unable to detect an intrinsic magnetic field (for the time being).

What if all planets have Inner Suns? What if some of these, like Venus at the moment, are in a state of transition, while perhaps the Mercurian field is at a maximum? That might explain why there is such a vast discrepancy in

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planetary behavior. Rotation may have very little, if anything, to do with the issue.

Prior to this disappointment with the Venusian magnetic field there were a number of astronomers who expected that the lights on Venus could be explained as a type of auroral phenomenon. The bright cusp caps, the ashen light, the mysterious spots, these it was hoped, could be explained away as a type of aurora.

Auroral phenomena are only supposed to exist on planets which have strong magnetic fields. The bright polar (cusp) caps were thought by some astronomers to be a type of aurora. In the 1950s, with Houtgast's results, it seemed to be an open and shut case that Venusian phenomena could be explained as being auroral in nature. Then the rug was pulled from under their feet by Pioneer.

The idea has lived on and as recently as 1990, Mark Chartrand raised the issue again even though it should be dead by now: "Despite the fact that Venus has no magnetic field, it seems to have auroras high in its atmosphere; their origin is not understood."[29]

Back in 1963, the astronomer C. M. Pither put forth the case for a Venusian aurora:

> It is a well known fact that the Earth's aurorae have their origin on the Sun. Every once in a while there are tremendous outbursts on the photosphere of the Sun; these are called solar flares and it is the ionized particles from such flares which are directed to the Earth's magnetic poles, giving auroral displays. **Venus is nearer the Sun than is the Earth**, **and on good grounds it is believed that Venus has a much stronger magnetic field than the Earth**. **Thus with a stronger magnetic field and closer proximity to the Sun**, **it is quite possible that aurorae occur in the cytherean atmosphere**. **Active observers**, **and those who make systematic studies of Venus are well aware of the bright areas called cusp caps**, **which occur at the cusps of the planet**, **and it is hoped to show in this report**, **and others that will follow**, **that these cusp caps might well be a type of aurora**, **and that these too have their origin in the Sun**.
>
> . . . **there is an interval of some twenty to forty hours before a stream of particles leaving the Sun's photosphere arrives at the**

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Earth. **The distance of Venus from the Sun is approximately 67 million mi**, **this being some two-thirds the distance of the Earth from the Sun; thus ionized particles from a solar flare should arrive in the region of Venus after a delay of some 14 to 28 hours**. Not all the observations of cusp caps the writer received corresponded with flares, but by far the larger percentage did. For this report the observations are placed into one of two groups. The first, Group P, are the observations that were preceded by a flare. The second, Group N–P, contains the observations that did not appear to be connected with a flare. Summarizing, the figures for each group are: Group P.–42. Group N–P.–9." "The total number of observations was 51; thus, as one can see, the proportion of observations falling in Group P is quite high." "The writer's original data sheets numbered some twenty sheets without an explanation of the report, and so would make this paper far too long; therefore only the basic details of the data sheets are given here.

Group P Observations

[Note: Group N–P observations are not reproduced here]

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Group P Observations				
Flares	Cusp Caps	Intensity - Size - Observer		
1961 June 01 11h05 U.T.	June 02 06h30 U.T. N. & S. caps	0	L	J.H.R.
	02 04h00 U.T. N cap	-	L	G.H.S.
1961 June 05 09h55 U.T.	June 06 04h31 U.T. N cap	0	M	C.M.P.
	06 06h40 U.T. N. & S caps	0	M	J.H.R.
1961 June 18 07h42 U.T.	June 19 04h04 U.T. S. cap	2	S	G.H.S.
	19 04h21m U.T. N. cap	0	L	C.M.P.
	19 07h10 U.T. N. cap		M	C.R.
1961 June 22 09h07 U.T.	June 23 04h04 U.T.	1		
	N. cap	-	S	G.H.S.
	S. cap	-	M	
	23 04h17 U.T. N. cap	0	S	C.M.P.
[Note: Group N-P observations are not reproduced here]				

Two scales are used in this report to describe the appearance of the cusp caps. The first is used to describe the intensity of the cap, i. e. its apparent brightness; ‘0’ for bright caps, ‘1’ for medium bright caps, and ‘2’ for dull caps. The other scale indicates the size of the cap; L for large caps, M for medium, and S for small caps.

The writer believes it worthwhile to return to the cusp caps recorded on 19 June. J. Hedley Robinson and the writer both agree that changes in the cusps of Venus can occur over fairly short periods of time; in the instance quoted there seems definitely to have been a change. On 19 June 1961, G. H. Smith was observing Venus at 0404 UT, and recorded a small S. cap of intensity 2. At 0421 UT,

E. M. Pither (the writer) was observing; the S. cap had by then faded away, and in its place was a N. cap; this being large and bright, intensity 0. By 0710 UT, C. Raeburn was observing; he, like

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> **C. M. Pither, recorded an N. cap, but by now both the size and intensity had dropped and Raeburn recorded the cap as medium of intensity 1.**
>
> Group N-P Observations. On 1961 May 13, C.M.P. and G.H.S. were both observing; C.M.P. at 0526 UT and GHS at 0440 UT. On May 12 solar flares had been reported, occurring at such times that cusp caps should have been detected on Venus; but neither observer recorded caps. It could be that local conditions on Venus prevented such detection, or that the flare particles did not reach the vicinity of the planet.
>
> Conclusion. During 1961 May and June, as can be seen, there are far more cases of correlation between cusp caps and solar flares than there are to the contrary. **The writer believes that here is a good case for stating that the cytherean cusp caps may be a type of aurora, which are the delayed effects produced in the atmosphere of Venus by solar flares**. But at the same time it is clear that this report is not conclusive, and that further observations are essential before any firm conclusions can be drawn.[30]

Pither attempted to show a link between the bright Venusian caps and solar flares to demonstrate that the cusp caps were a “type” of aurora. Broadly speaking, Pither may be partly right. What Pither could not have suspected is that Venus might have its own light source inside the planet.

Pither does manage to demonstrate a partial coupling between the Venusian cusp caps and solar flares. This may help us to find a solution to the coupling effect between the Sun and Inner Suns. I suspect that perhaps the coupling effect is enhanced by the presence of a strong magnetic field. The magnetic field of the Sun may trigger a sympathetic reaction in an Inner Sun by way of the magnetic field produced by that Inner Sun. Could it be that the stronger the magnetic field, the stronger the coupling? The magnetic lines of force might lead into the interior of an Inner Sun.

Is a planetary magnetic field affected by the rotation of a Hollow Planet around its Inner Sun? Does the Inner Sun produce a magnetic field which is perhaps enhanced or deformed by the rotation of the planet? Can the rapid rotation of a planet enhance this field? I would suspect that various minerals and metals in the planet may deform the Inner Sun’s magnetic field. Many

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questions abound.

The current explanation for the cusp caps is that they are the result of an aerosol high in the polar atmosphere, higher than the normal cloud level. But is this explanation correct? Consider the observations of Pither, Smith and Raeburn on 19 June. Take a look at the cusp caps in Figure 6.10. The diameter of Venus is 7,700 mi. A quick measurement of the top-most cusp cap shows it to be in the order of 1500+ mi in diameter. Pither compares his observation at 0421 with that of Smith at 0404. In that short time the small southern cap had faded away totally while a large bright northern cap had suddenly appeared. If this were the product of an air-wave, then it would have to be a wave of aerosols which are travelling at incredible speeds. What could produce such a powerful shock wave? A central Sun perhaps? With regard to the Earth's meteorology we will be examining a similar simple idea. We will examine the possibility that a planet's central Sun is somehow coupled to the Sun. Solar flares might serve as a trigger to a central Sun. Such a central Sun might then generate weather, and perhaps cause an outpouring of air from inside the planet. This air would then rush out of the Polar Holes. As has been mentioned before, perhaps an Inner Sun inside Venus is responsible for the disassociation of atoms in the first place. A suitable magnetic trigger might cause increased activity in an Inner Sun. This might then create a powerful shock wave which thrusts vast quantities of this air out into the polar atmosphere. This might be what causes those bright cusp caps.

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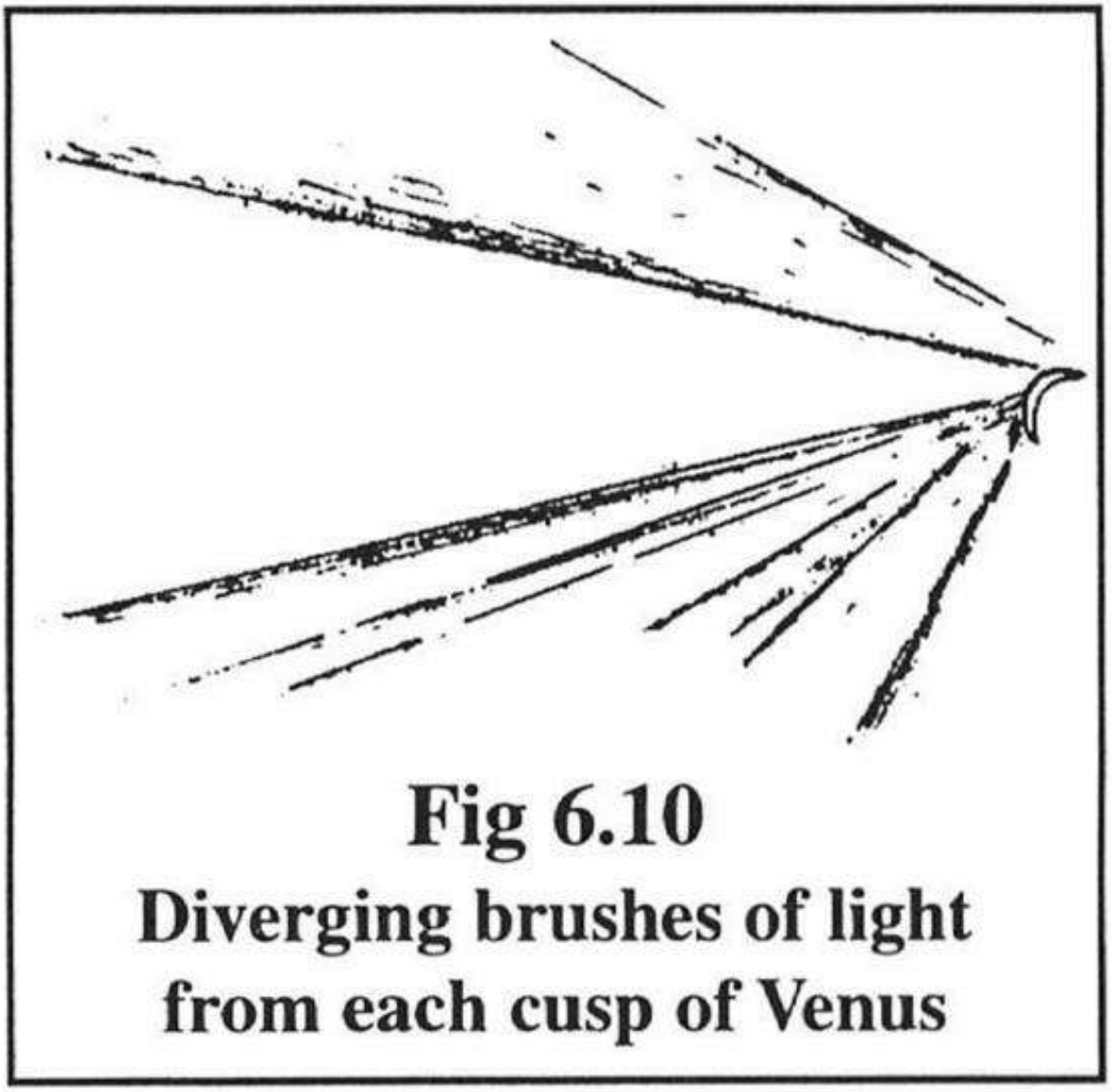

Fig 6.10
Diverging brushes of light from each cusp of Venus

Venus is still without a magnetic field, and yet, these strange brightenings seem to be partially correlated to solar flares. Could it be that a Venusian Inner Sun is the cause of all these phenomenon? Is it possible that the Earth's aurora is also partially linked to the existence of an Inner Sun?

THE MAEDLER PHENOMENON

In 1978, Richard Baum wrote:

One of the strangest observations ever recorded of Venus was made by the renowned German astronomer Johann Heinrich Maedler with a four–

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inch refracting telescope on 7 Apr 1833. At the time Venus stood east of the Sun and was well placed for observation. In his Beitrage (1841) Maedler tells us how on that evening numerous brushes of light were seen to emanate from the illuminated limb of the planet, then a crescent, and to diverge **in a sunward direction**. Note: The brushes pointed towards the Sun.) These brushes or rays were roughly fan-shaped, and invested Venus with the look of a broad multi-tailed comet. According to the sketch which accompanies Maedler's account (See Figure 6.10), **the brushes originated at the extremities of the crescent and extended along the limb to affect an arc of between 50° and 60° from the tip of each cusp**. No brushes are depicted in the segment between, i.e., the center of the limb. **Maedler watched for some considerable time and tested the appearance for illusion by rotation of the ocular and by change of magnification; but although he attempted no explanation**, **he concluded that the appearance was at least real**.

Here is a truly astonishing phenomenon. Uniquely different in its characteristics, gross aberration is immediately suspected. Venus is a difficult subject when studied with the telescope. On a dark sky its glare baffles and tricks even the most practiced eye. **And yet it is hard to believe that Maedler**, **the eminent principal author of the first adequate description of the lunar topography (1837)**, **could have been so deceived**. **He was a born observer**, **skilled**, **competent**, **and experienced**. **True**, **his phenomenon is bizarre but is that a reason to deny it reality?** In fact, was Maedler mistaken? Were his mysterious coruscations simply the result of glare? Of dirty optics? Perhaps a greasy optical surface? If not, to what can they be ascribed?

Illusion, of course, cannot be ruled out. However, a work by John Gadbury, *Nauticum Astrologicum*, or the *Astrological Seaman*, published posthumously in 1710, suggests otherwise. Gadbury described himself as 'a student of physick and astrology,' and is mentioned in *Aubrey's Brief Lives*, and by Augustus De Morgan in his *A Budget of Paradoxes* (1872), who speaks of him as **'A well informed astronomer' and the author of a treatise on comets (1665)**. In 1655 Gadbury published the first of a long series of annual Ephemerides, and the following year his Emendation of Hartgil's Astronomical Tables. . .

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But Gadbury was more than a writer. He was a keen and careful watcher of natural phenomena. Between Nov 1668 and 31 Dec 1689 he kept a diary which, to quote his words, was “designed for the service of philosophers, physicians, astrologers and all other faithful observers of the various wonders that are to be found in God’s creation.” It was, he further states, his own unaided work and a labor of love. Though little known, the diary is a valuable record of late 17th century London weather, and a fascinating register of optical phenomena seen from London. At that time Gadbury lived in Brick Court, College Street, Westminster, not far from the Abbey. The diary forms a supplement to the Nauticum Astrologicum, the manuscript of which was completed in 1698, and appears between pages 129 and 245. It is complete for the period stated.

Unlike his contemporary chroniclers, Gadbury did not confine himself to daytime events, but as he quaintly remarks, caused himself ‘the pains of nocturnal watchings.’ Thus many entries refer to coronae around Venus and Jupiter, and occasionally around Mars and some of the brighter stars. Saturn is also mentioned in this connection, and lunar haloes and coronae are frequently logged. Double and single rainbows were faith-fully recorded: on 8 June 1682 a lunar bow was visible from Westminster at 23 hrs. But it is the observations of 29 Jan and 21 Feb 1686 (Old Style) which attract attention. **On these dates Gadbury noted that Venus appeared ‘like a comet.’ The resemblance to the Maedler observation is striking**.

To explain the Gadbury phenomenon, it is necessary to infer that the rays of Venus were reflected from a cloud of ice-flakes floating with their bases slightly inclined relative to the horizontal position. The rising or setting Sun is occasionally surmounted by such a luminous brush, and this is formed in precisely the same way. Sometimes the appearance is visible when the Sun is below the horizon. Minnaert also informs us that brushes or pillars have been seen beneath the Sun, although of much shorter length. Oblique or distorted pillars are not unknown. Some on record apparently deviated as much as 20° from the vertical. Minnaert believes this deviation is caused by air currents wafting the ice crystals into a slanted direction.

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> We do not know what happened back in 1833. There are many gaps and uncertainties in our knowledge. Maedler expressed no simile, but his drawing and description eloquently favor comparison with Gadbury. **Putting aside the fact that the former observed telescopically**, it is conceivable that his phenomenon is analogous to that of 1686, and belongs to the regime of atmospheric optics, being in all probability an exotic form of light pillar classified by Minnaert as oblique or distorted. It would be useful if observers would alert themselves to a possible recurrence of this interesting, if rare, phenomenon, especially telescopic observers of Venus. In the event a full description should be made, including details of weather conditions and cloud types involved.[31]

In an e-mail to me dated 10 May 1998, Baum wrote:

> Kepler at Graz, 11 June 1598, wrote to Maestlin, his mentor, **'my countrymen maintained that they have seen at times Venus as a comet** [an omen of threat and disaster]. When asked about it, I said that, according to my opinion, there is no milder star in the heavens.'[32]

The implication made by Baum above is that perhaps Kepler's countrymen were being literal when they stated that Venus had the appearance of a comet. Perhaps they did not mean it in figurative terms (i.e. bad omen), but as a fact.

What did Maedler and Gadbury see? The phenomenon is extremely rare and these are the only accounts of it. The real difference between the observers is that Maedler was using a telescope and Gadbury was not. Or was he? He is described as a well informed astronomer.

Baum's theory that Gadbury saw a refraction phenomenon may be relatively sound. I cannot fault him on that. He is quite certain that Maedler's sighting cannot be explained in the same manner. He also wonders about Kepler's countrymen and specific points whether they also saw this phenomenon through telescopes? Baum suggests that other astronomers keep an eye open for this phenomenon in case they see it again. Clearly he takes it seriously.

Maedler's telescope specifically showed light emanating from both Venusian cusps, from the very area where we get the bright cusps, horns, etc. Maedler took various precautions to ensure that it was real, and not some

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telescope fault. As Baum states , Maedler was a very fine astronomer. I think we can rule out re fraction for Maedler ’s sighting because he used a telescope and could see the specific points on the planet’s surface from whence the light emanated.

Gadbury’s sighting is more questionable. Baum might be right that Gadbury saw a refraction phenomon. Yet, we should not totally rule out the possibility that Gadbury saw the Maedler phenomenon, but on a grander scale. What if Gadbury’s sighting was indeed a real phenomenon?

Turning to Maedler’s observation, what could possibly account for this? Figure 6.11 shows how light from inside Venus could have caused this phenomenon. Maedler saw the light pointing sunward. This is the opposite of what happens to a comet. A comet’s tail is directed away from the Sun by the solar wind. Clearly, this explanation will not work for what Maedler saw. His phenomenon could only have been caused if an Inner Sun was quite a distance off center in the direction away from the Sun. Light from an Inner Sun would then shine out through both Polar Holes at an angle, pointing towards the Sun. The light would be refracted by the hot, dense atmosphere, and there would be a fan pointing towards the Sun from both Polar Holes.

Why hasn’t this happened again? Why doesn’t this happen more often? In order for us to see this light it must be reflected off something. When the light is refracted, it might often appear to us as a large oval spot when it is not centered on a pole. We might see the oval because the light is being reflected by atmospheric particles. We would never see the light out in space because there is nothing for it to reflect off.

There is astronomical evidence for the existence of large clouds of dust which float through the solar system from time to time. Such dust clouds have been noted on odd occasions during the past few hundred years and have sometimes caused the darkening of the sky in the middle of the day. People have panicked thinking it was the end of the world.

In order for us to see the Sun shining out of the Venusian Polar Holes as Maedler did, Venus would have had to be passing through a very large and very dense cloud of dust at the time. Such a cloud would highlight the powerful “searchlights” of the Inner Sun pointing out of the two poles. The Reader should consider too, that since both the “tails” of light were pointing towards the Sun, they must therefore have a common origin inside Venus as per the above diagram.

Did Gadbury see this on a vast scale? I have no idea. Gadbury likened

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Venus to a comet. Was he seeing something slightly different? We have Maedler's drawing so we know exactly what he saw. Sadly neither Gadbury nor Kepler tell us more. I think there is only a small chance that indeed Gadbury did see something of value. For him to have seen it with the naked eye would mean that the dust cloud must have been far larger and more concentrated than that which Maedler saw. Gadbury's sighting is open to question.

Maedler on the other hand was a very experienced and conscientious astronomer and he carried out a number of tests to satisfy himself that this phenomenon was real. If we take this piece of evidence along with all that has come before then this phenomenon might be real for it is absolutely in "character" with all else which we know about strange Venus. If Venus is hollow then this sort of thing is to be expected, and rare though it may be, it will undoubtedly happen again some time in the future. It might be quite a long wait.

Perhaps the thickness of the Venusian clouds often prevents a central Sun's light from shining out. Of course, we can't be totally certain of this. There are so many bright polar phenomena on Venus that perhaps many are indirectly related to an Inner Sun. Perhaps an Inner Sun does help to light up those bright cusp caps to a certain degree? Perhaps on this occasion the Venusian atmosphere cleared abnormally thereby allowing large amounts of light to escape into space, and Maedler was lucky enough for this to be reflected off a passing dust cloud?

Richard Baum's open-minded attitude deserves to be applauded. He stated: "True, his phenomenon is bizarre but is that a reason to deny it reality?" Solid planets cannot possibly be light sources, so Baum really did not have any logical choice in the matter.

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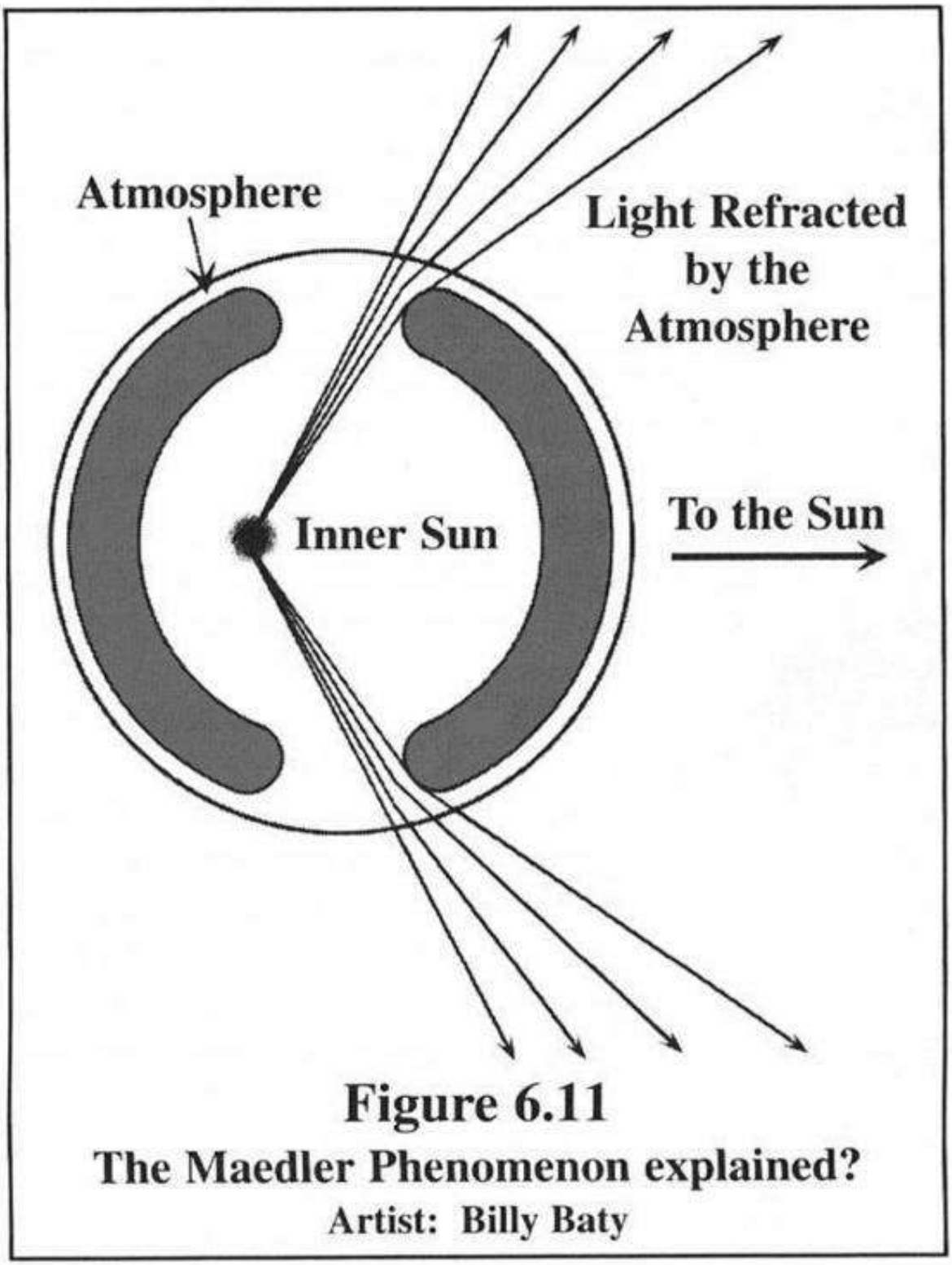

Figure 6.11

The Maedler Phenomenon explained?

Artist: Billy Baty

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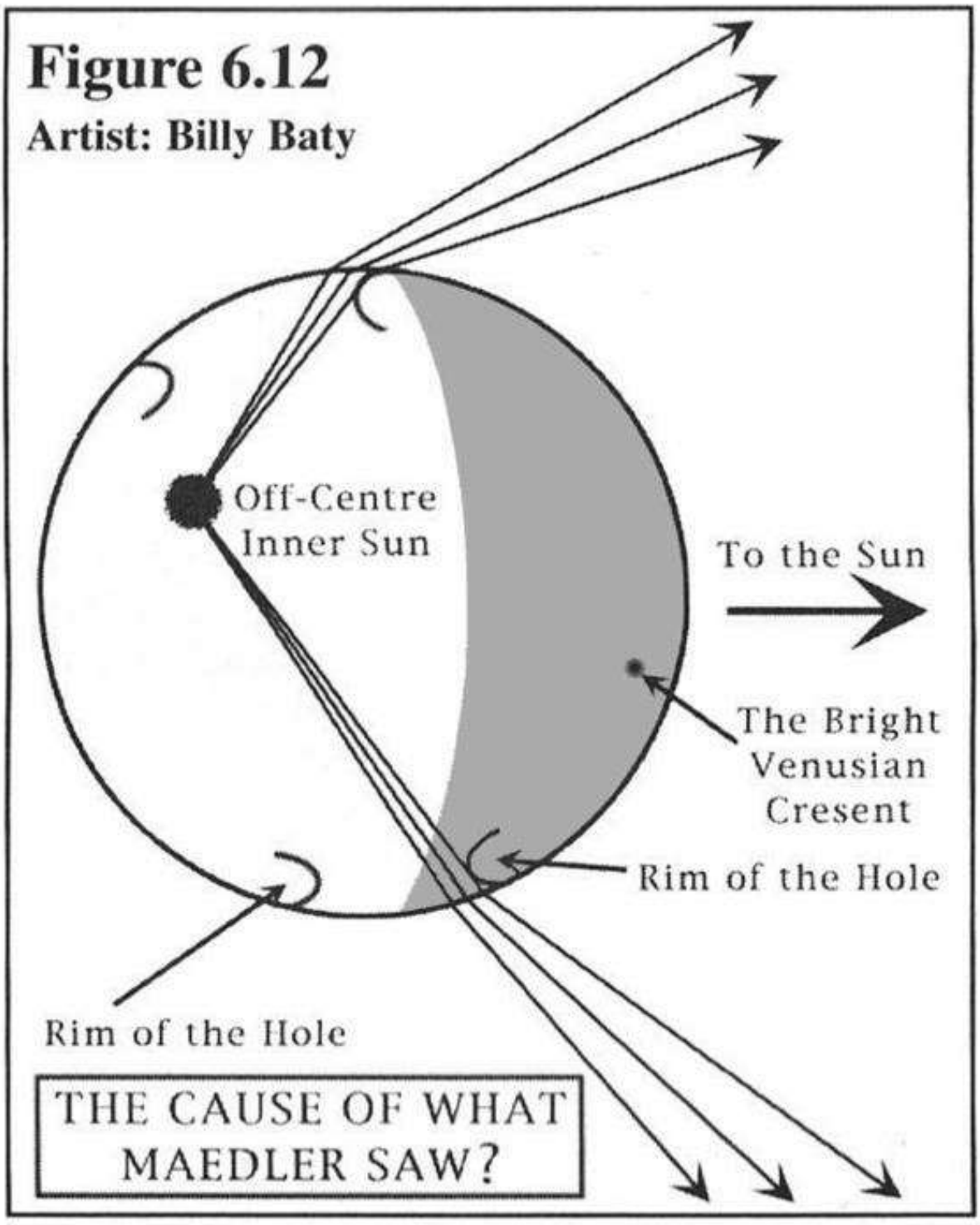

Figure 6.12 shows the results of Figure 6.11 when Venus is seen as a crescent as Maedler saw it. I have marked the position under the clouds where the rims of the Polar Holes might be. Kindly note that the atmosphere covers the holes, leaving Venus perfectly circular in shape, while the light

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escapes from the rim beneath the clouds. In order to reproduce the phenomenon as Maedler saw it, the holes might have to be slightly tilted away from the geographic poles, and the Inner Sun would have to be offset closer to one hole. Perhaps the passing dust cloud was more dense in the direction of the Sun?

Perhaps an Inner Sun will wobble around inside a planet? If so it might partly account for the strange direction of the light.

What Maedler saw was a one-time event. If a passing dust cloud should ever go by Venus again, the configuration might change, depending upon the tilt of the planet and the position of the Inner Sun inside it at the time. If the Inner Sun were off-center, in the direction of our Sun, for example, the rays of light emerging from the Polar Holes would point away from the Sun. Perhaps scientists would claim that this was the result of ‘outgassing’ and that these materials are being carried away by the solar wind? These are the problems one faces when trying to confront the current theories. Sometimes the same thing can be interpreted in many ways.

It is highly unlikely that this perfect match (to a thoroughly discredited theory such as this) is due to pure luck. The directions of the brushes of light gives us an indication of the position of an Inner Sun inside Venus at that time.

Kindly note that the Maedler phenomenon cannot be explained as being some kind of auroral phenomenon because the light which Maedler saw pointed towards the Sun and not away from it. If this was caused by particles carried along by the solar wind it would have pointed away from the Sun. What he saw was light being emitted from the Polar Holes of Venus. There was no interaction with the solar wind whatsoever.

The Maedler phenomenon is an example of the extreme strangeness which can confront astronomers and which can make them disbelieve their own eyes. I must say that Maedler’s objectivity and his straight-forward reporting is quite amazing. That he actually reported this observation shows his extreme courage. He could easily have been mocked for this observation. While reading various scientific literature I have noticed many occasions where scientists have disbelieved their own scientific instruments. Sometimes these were perhaps really faulty. But other times such explanations were not workable. Sometimes the “objective” machines seem to go “hay wire.” Since the results are so utterly unexpected, and the scientists do not have the necessary paradigm to fit this into they probably write these things off as

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machine faults even when there may be no real reason to. I'm quite willing to bet that there is much more which they have encountered which they could never make sense of and which they then ignored—even here on Earth. The discovery of the ozone holes was totally accidental. At first scientists could not believe their instruments. But there may be other things which are even stranger.

Considering the utter strangeness of Maedler's sighting, I would not be surprised if more astronomers had already seen such a thing, but were too astonished by it to report it. Or perhaps they were utterly convinced that it must be an illusion of some kind.

I think that the first step towards making some real headway is to accept that reality might not be what we expect it to be. If we dropped some of our preconceived ideas of how planets should behave we may find ourselves solving these problems much faster.

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Chapter 7: The Shape Shifting Planets

Now that the Reader has a deeper understanding of Venus, let us bring all this information together. We will now study the meteorology of a planet which may have gigantic holes in it. And we will see the amazing effects which these holes have on the planet's atmospheric behavior. One of the effects is that Venus seems to "change shape." This is known as the "Schroter effect" or the "Phase Anomaly" of Venus.

THE PHASE ANOMALY OF VENUS

When I was doing my study of Venus I happened upon this strange and well-documented phenomenon. It took me quite some time to realize what was really happening. I kept wondering if it could be related to Hollow Planets. At first I wondered if something was happening to the cloud levels at the equator perhaps. Only later did I reach a realization similar to that of Patrick Moore and Henry Brinton. I now believe that they, to their credit, came closer to solving this problem than anyone else. To me, this is the final, supreme problem preventing a full understanding of what is happening on Venus. The key to this phenomenon lies in a detailed understanding of Venusian polar phenomenon. The resulting analysis had me riveted. I could barely believe what was happening on this incredible planet. It's no wonder that most scientists can't make sense of the Phase Anomaly of Venus.

Prior to this study of mine I had regarded Venus as a boring white world. Now I think it is the most incredible planet in the entire solar system. Perhaps you will join me in sharing this view.

Venus goes through phases like our Moon. At a certain point in its orbit, relative to the Earth, Venus will appear as a "half-moon" shape. This is easy to predict. The problem is that Venus never matches this prediction. Venus is either a few days early or a few days late. This is of course contrary to our understanding of physics. The Moon goes through its phases like clock-work and so too should Venus. It is inconceivable that it does not.

I asked Dale Cruikshank what he thought of the Phase Anomaly of Venus. In his reply on 30 Oct 1997 he wrote as follows:

The Phase Anomaly of Venus, which I have also studied, is an optical

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> effect of only marginal interest in terms of the physics of Venus' atmosphere. I do not attribute this effect to anything more than the impaired ability of the eye to perceive low illumination levels when the main part of the disk of Venus is so extremely bright. **In particular**, **the Phase Anomaly does not indicate anything anomalous about the motion of the planet or about the optical properties of its atmosphere.**

In that short paragraph Cruikshank dispenses with this mystery. But astronomers from the British Astronomical Association would disagree with him. I would like to take you through the various literature and observations regarding this phenomenon. You can determine for yourself whether Cruikshank really appreciates this problem. He fobs it off in a few short sentences and yet it has remained a mystery to other astronomers for more than 200 years.

As Venus draws closer to the Earth, it changes from being gibbous to a semi-circle and then to a crescent. It goes through phases like the Moon. This gives us the opportunity to see the terminator clearly. Venus, at its closest approach is closer than even Mars. It approaches to within 26 million mi of the Earth, with is slightly more than 100 times the distance of the Moon.

Dichotomy is when Venus should appear exactly as a semi-circle. At this point the terminator should be an exactly straight line down the middle of the planet. Actual observation has shown that Venus never reaches theoretical dichotomy at the predicted time. It is always either a few days early or a few days late. There is absolutely no consistency in this pattern. No one has ever been able to predict when it would be early or late or by how much. It has been discovered that the problem exists not only at dichotomy but at all other times as well. If the Phase Anomaly were a simple atmospheric phenomenon as Dale Cruikshank tries to pretend then it should be predictable. But it is not.

J. H. Schroter was the first astronomer to notice it in 1793. It is therefore often called the "Schroter Effect." Venus's phase anomaly is obvious to all dedicated observers of the planet. There is some agreement on the major aspects of the phenomenon. The problem is further complicated because the Venusian phase is often difficult to measure. All manner of theories have been proposed to account for the Schroter effect, but none of them work. The main issue is that the phenomenon has no detectable pattern. If the problem were truly a characteristic of the Venusian atmosphere then it should show

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some consistency. e.g. Venus would always be late during western elongations and early in eastern elongations or some other similar, predictable pattern. But the fact is that it can be early or late at any point in its orbit.

The Phase Anomaly of Venus has mystified astronomers for at least two centuries. But never during that time did anyone ever consider the possibility that Venus might be hollow. It is amazing that this phenomenon was first discovered not long after the death of Leonhard Euler. No Hollow Earth proposal I know of has ever mentioned the Phase Anomaly of Venus. Many scientists have tended to down-play its importance. However, it might be much more important than they think. Patrick Moore, Richard Baum and other dedicated astronomers have often pondered this problem and consider it very real.

For a theory to be viable it must be able to explain things and it must be able to make predictions. Take a look at how this, the most discredited of all theories makes sense with regard to the Phase Anomaly of Venus.

Let us review the facts. Either light is not behaving the way it should, in the vicinity of Venus, or the spherical form of Venus is undergoing change. I do not see how light could be the problem in this case, since the light we are seeing is being reflected off the top of the Venusian atmosphere. The refraction of light cannot possibly be the cause of the problem since we are not seeing light which is coming up through the atmosphere. We are merely seeing the Sun’s light being reflected off the day-side of Venus. The astronomers are puzzled by the position of the terminator of Venus. Sometimes it is too far towards the night side, and at other times too far towards the day side. The terminator is therefore “waving” back and forth, to and away from the Sun—over a period of months.

As astronomers define it, the Phase Anomaly is regarded as a problem with the position of the terminator. Yet this is not a full definition of the problem. The Reader should by now be aware of other factors which serve to complicate the problem. There might be a tremendous rise and fall of the Venusian polar vortex. There might also be light which sometimes shines out of the planet. There may also be disassociated atoms being blown out of the planet which then become luminous when they recombine later. Dust storms might cause the Venusian cusps to become blunted. All these changes bedevil the attempts of Astronomers who are trying very hard to determine the phase of Venus accurately. The general belief was that the Venusian phase is

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retarded in the western elongation, and accelerated in eastern elongations. As the Reader will soon see, this is not true. The evidence indicates that phase acceleration and retardation can occur anytime.

A further complication arises when the terminator begins to change shape. Instead of being a straight line, or a gentle crescent shaped curve, it becomes wavy at various points.

The Phase Anomaly of Venus can only be caused by varying lighting conditions on Venus. Since Venus has a thick atmosphere and two possible Polar Holes, it is apparent that large scale fluctuations in the Venusian atmosphere may be a contributing factor. Now that we have identified the many factors which are at work, the solution will fall perfectly into place.

In 1961 M. Rushton wrote:

> In August, 1958, a short article appeared in *Sky and Telescope* which mentioned the work of two Russian amateurs, Michelson and Petrov, on this subject.
>
> **These observations indicate a definite pattern in which the crescent appears larger than expected**, **while the reverse is true for the gibbous phase**. The first question to arise concerning these observations is that of their accuracy. Since the measurements were made from drawings, the question of 'personal equation' must be carefully considered. It can be answered in part by the comparison of their work with that of other observers. However, accurate measurements of this phenomenon for extended periods of time are somewhat rare. Henry McEwen, a past Section Director of the British Astronomical Association, made over 900 measurements of the phase variation using a Slade micrometer mounted on a 5–inch altazimuth telescope. The eyepieces employed were a Ramsden of 156 diameters and a Zeiss orthoscopic of 180 diameters. All measurements were made in daylight in order to reduce the effects of irradiation. A discussion of the observations made during the period 1919–27 appeared in the *Journal of the British Astronomical Association*. Figure 7.1 shows the results of McEwen's work. **Many observers claim that the retardation of the phase is greater in western elongations (or apparitions) than its acceleration in eastern ones. The graph for the western elongation of 1927 contradicts this belief**, **for it in no way differs radically from**

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the graphs of the other elongations. However, it must be stressed that the graph represents only 25 observations during one elongation. These curves in Figure 7.1 indicate a relatively constant rate of change during the gibbous phase of the planet with the maximum deviation occurring near the time of dichotomy, although the evidence is insufficient to give more than a strong indication of this condition.

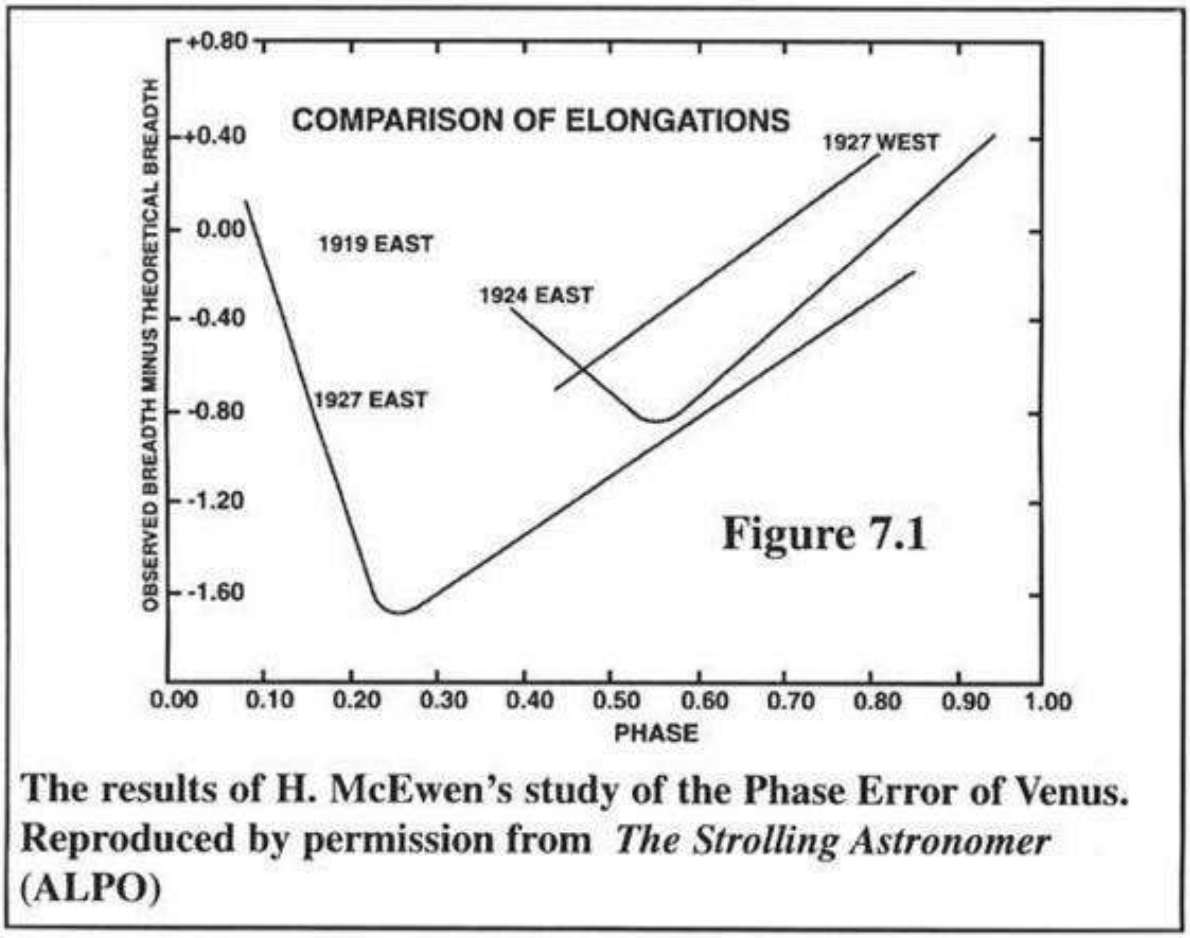

Figure 7.1

The results of H. McEwen's study of the Phase Error of Venus. Reproduced by permission from *The Strolling Astronomer* (ALPO)

It is, of course, obvious that McEwen's results differ radically from those of Michelson and Petrov. While the two sets of results agree approximately as to the degree of the variation they disagree entirely on its distribution. McEwen shows the planet as being smaller than its theoretical size, except near conjunctions. Michelson and Petrov show Venus as larger in the crescent phase and smaller in the gibbous phase than theory predicts. Since McEwen's measurements were made at the telescope, and not from drawings,his results may be considered

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the more reliable of the two sets.

The variation between the times of observed and theoretical dichotomy, although only a small part of the more general problem, is the best observed part of the deviation from theory. **Apparent dichotomy is invariably late in western elongations (apparitions) and early in eastern ones**, **but the amount of the deviation from theory is highly variable**. However, the average time lag is about 3.5–4 days.

The cause of the Phase-error can only be guessed at, **for the present state of knowledge concerning Venus offers little to explain it. Irradiation and various other factors affecting micrometric observations would tend generally to increase the apparent diameter**, **not to cause the results which McEwen obtained**. One implication of this deficiency of illumination is the stoppage of light in the Venusian atmosphere by some cause other than absorption. Arthur Clayden suggested a sloping cloud surface along the terminator as the answer, but this would require a greater temperature difference between the day and night hemispheres than actually exists." (*Author's note*: The sloping cloud surface would only be valid if the acceleration and retardation was strictly in accordance with eastern and western elongations. As can be seen, McEwen's very accurate measurements are in conflict with the work of Petrov, *et al.*; and also with the long tradition of this phenomenon. Even though drawings might not be as accurate, they do nevertheless reflect fact. McEwen's measurements were carried out over a limited period of time. If these were done over a 10 year period I am sure his other measurements would at times have been in line with "tradition." The problem is not as simple as a mere sloping cloud at the terminator, nor does irradiation explain it. The inconsistent nature of the problem has a tendency to destroy all such explanations.)

Many factors, seeing conditions, nearness of dusky markings, aperture, individual visual acuity, depth of the terminator shading, and the sky background—affect estimates of the phase, but their importance is not fully known. A study of the effect of these factors on the apparent terminator is vital to the accurate evaluation of micro-metric

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> measurements; but, as yet, this study has not been made. **Relatively little work has been done on the Phase-error of Venus**, **except for the short period near dichotomy. The major need is for frequent micrometric observations of the planet's apparent equatorial diameter over extended periods of time**. These measurements, which should be made in daylight under standardized conditions, would contribute much to our knowledge of Venus. The previous work gives strong indications of a definite phase-error, but many questions exist as to its nature and degree. Much still remains to be done, yet real progress has been made.[1]

As the above excerpt mentions, the Phase Anomaly is most apparent at dichotomy, when Venus has a "half-moon" shape and the terminator should be a perfectly straight line. It is at these times obvious that it is not a straight line. Detecting the phase anomaly at other parts of the Venusian phase is much more difficult. McEwen's work must definitely be regarded as the most accurate ever done.

In 1963, Brian Warner of the British Astronomical Association wrote the following:

> Observations of the planet Venus made at the time of theoretical dichotomy usually show that in reality more than fifty per cent of the whole disc is visible. **The way in which a visual observer judges the time of dichotomy is to note when the terminator becomes straight along the whole of its length. It often turns out that at the time of theoretical half-phase the terminator is linear near the center of the disc but the planet shows horns at the poles**. Figure 7.2 shows four outlines of Venus taken from drawings made by members of the Mercury and Venus Section, all of which were made at times of theoretical dichotomy and which demonstrate the non-linear nature of the terminator at this time. In general there is a time difference of about four to six days between times of theoretical and observed dichotomy. This Phase Anomaly has been termed 'Schroter's Effect' by Moore."

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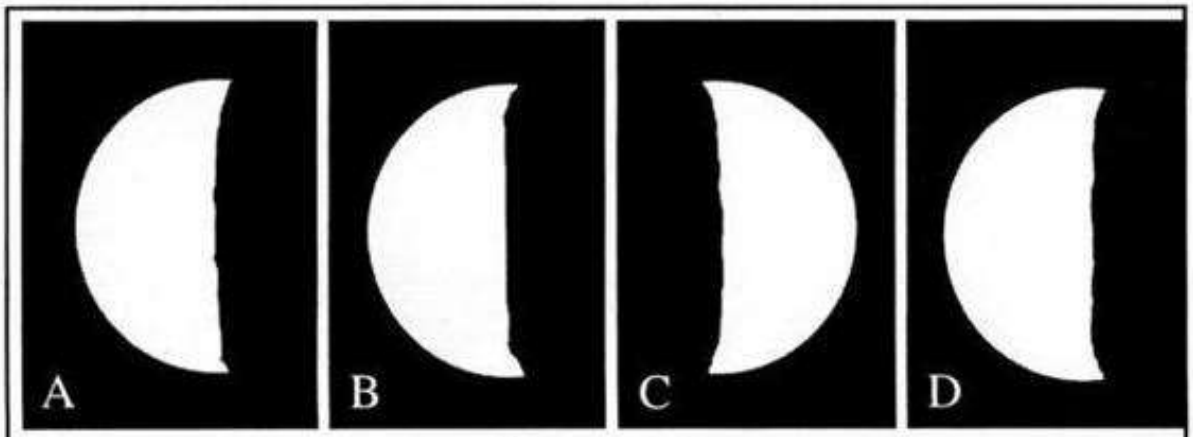

Figure 7.2
Four observations of the phase anomaly of Venus drawn at theoretical dichotomy (half phase). *British Astronomical Association*

The observational situation is, however, much more complex than Schroter's Effect alone. **It is obvious that a difference in observed and calculated phase at the time of dichotomy must be accompanied by incorrect apparent phases at other times**, **near dichotomy**, but it was not until a book by Bronshten recently appeared that we knew just how large the (O–C)s are for phases other than 0.5. The results quoted in Bronshten's book are from measurements made by N. N. Michelson and V. N. Petrov. These results are depicted schematically in Figure 7.3. Unfortunately only observational drawings were used by Michelson and Petrov, it would of course be preferable to have a long series of direct micrometric measures of the phase of Venus. I have measured a large number of drawings myself and arrive at identical conclusions to those shown in Figure 7.3, but with some additional points to be discussed later in this paper. It can be seen from Figure 7.3 that the (O–C) phase can be as large as approx. 0.10 for phases near 0.1 and 0.9.

I now propose to discuss in some detail the observed effects at the time of dichotomy and their possible theoretical interpretation. It is fair to say that a recent paper by Strong has stimulated this discussion.

It is quite evident that if Venus were a solid body devoid of atmosphere then an effect like that shown in Figure 7.3 could not possibly arise by physical means. The explanation of Schroter's

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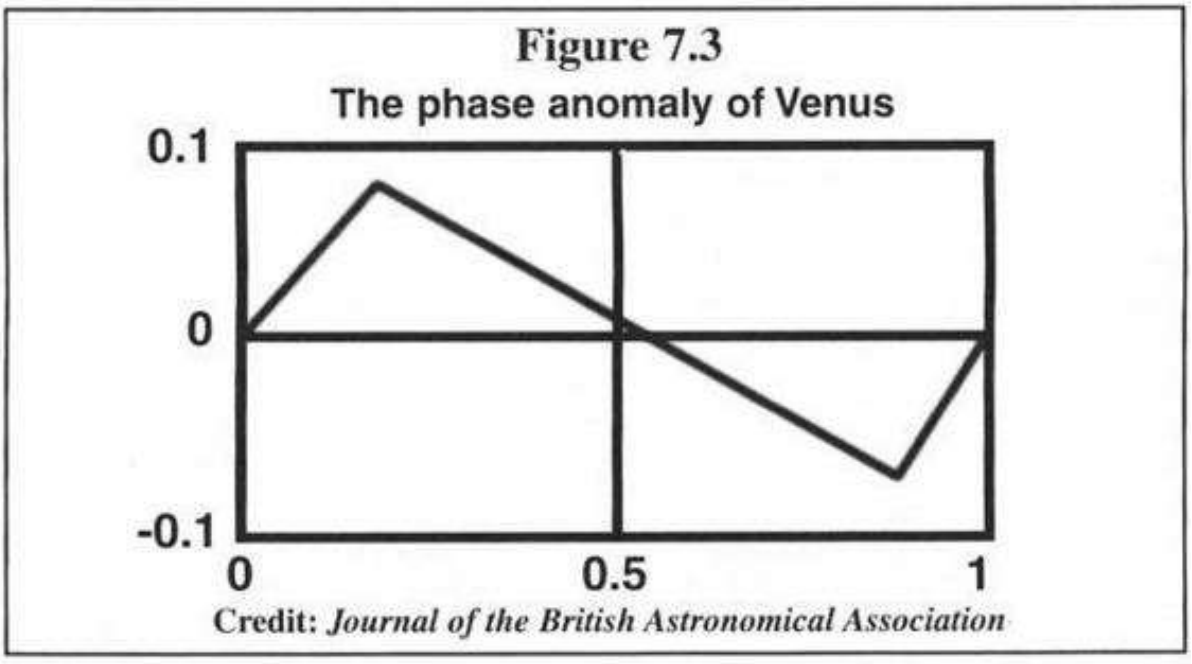
Effect must therefore lie in the detailed properties of the cytherean atmosphere. In the interpretation of the prolongation of the cusps of Venus near the time of inferior conjunction Edson has postulated the existence of a thin scattering layer lying above the main cloud layer of Venus. Strong has suggested that this layer can qualitatively explain Schroter's Effect. Contrary to Strong's statement at least two previous explanations of Schroter's Effect have been given. The first was by Clayden in 1909. Clayden was well aware of 'the acceleration of phase in eastern elongation' and 'the retardation of phase in the western elongation'. He proposed an explanation based on the non-uniformity of the Cytherean clouds near the terminator. Also McEwen has proposed a refractional theory which cannot now be taken seriously.[2]



Thus Brian Warner concurs with the results of Petrov, Michelson and McEwen. He finds that the theoretical phase differs from the observed phase at all times. And he ends up by rejecting all the theories proposed so far. As can be seen, theories have been proposed as far back as 1909, and very possibly even earlier. But none of them make any sense. Figure 7.2, especially drawing (b), shows how Venus really does have a straight line down its center at dichotomy. But why does this line curve in the polar regions? Many astronomers have noticed this, and this is indeed the key.

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Take careful note that at dichotomy it is absolutely impossible for the terminator to be anything but a straight line. This is simple physics. The light in the polar regions is extending into the night side of Venus. It either comes from disassociated atoms recombining or a central Sun which is lighting the Venusian polar atmosphere outside the Polar Holes.

In 1963, K. R. Brasch wrote the following in the Journal of the *Royal Astronomical Society of Canada*:

> Theoretically it should be possible accurately to predict (to within a few hours) the date when exactly half of Venus is lit by the Sun. This should occur at greatest elongation, when the angle between the Earth and Sun is exactly 90° with respect to Venus. **However**, **this is found almost never to be the case**, **and there is a discrepancy of several days both at eastern and western elongations. No satisfactory explanation for this has been given as yet**.
>
> In the past two evening apparitions, 1960–61 and 1962, a special study of the planet's phase was undertaken by the Montreal Center. In the absence of micrometer measurements, the phase was measured directly from drawings. **Although this method may seem crude**, **it was found that the portrayal of phase by the more experienced observers was sufficiently consistent to be used for this purpose**. The average difference in phase estimated by three observers, G. Wedge, G. Gaherty and K. Brasch, was from 1–4%.
>
> The observed values for both apparitions were plotted on graphs together with the curves of the predicted phases. In 1960–61, from a total of 32 observations made before dichotomy it was found that the observed phase was about 5% less than the theoretical value, i.e. the observed disk had about 5% less illumination than expected. This corresponds to a dichotomy 8 days earlier than the predicted date of 30 Jan 1961. **The observed half-phase was indeed 7 to 10 days early**, occurring between 21 and 23 Jan 1961. There is considerable scatter among the values obtained early in this apparition; this can probably be attributed to the lack of experience of the observers.
>
> In 1962 there is a higher degree of mutual agreement among the values obtained. From a total of 42 observations before dichotomy, the average

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> deviation was 6.7%, indicating that the half phase would be approximately 14 days early. It was observed to occur about 11 to 13 days early, between 21–23 August, compared with the predicted date of 2 Sept 1962.[3]

K. R. Brasch concurs with the findings of all the others. The Venusian phase differed from prediction by more than a week. In astronomy this is a major disaster. Normally such things could be predicted to within a matter of hours since the orbits and movements of the planets are so well-known.

In 1963, H. Brinton, and Patrick Moore also tackled the problem, and came close to solving it:

> The 'Schroter Effect' or Phase Anomaly of Venus is well-known, and has been discussed in all the recent Section Reports. The present note concerns some rather puzzling observations made by the writers. Moore wishes to make it clear that he is writing as an observer, and not in his capacity as Director of the Section.
>
> Venus was interesting in 1962 when, during July and August, it became clear that the phase was decidedly less than theoretical. Of the present writers Brinton used his 12–inch reflector, together with one observation with the 18–inch refractor at the Pino Torinese Observatory in Italy, while Moore used his 8.5–inch reflector and, on occasions, Brinton's 12–inch. **During observations made after dichotomy**, **it was noticed that there was an increased difficulty in determining phase** (*Author's note*: The astronomers were experiencing difficulty determining the phase. This is of critical importance).
>
> **Upon examination**, **it appeared that this was due to a discrepancy between the visible and theoretical shapes of the telescopic image of the planet. Being close to dichotomy**, **the image should have been almost exactly a semi-circle. In fact**, **it appeared as a segment bounded by a chord smaller than a diameter. Such an appearance could only result from viewing a sphere which is less than half illuminated**, **which seemed**, **on the face of it**, **to be absurd**. (*Author's note:* The explanation above is not the only alternative. It does not necessarily mean that less than half the sphere is illuminated. Another possibility is that the "horns" are protruding further than they should,

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thereby making the sphere appear slightly larger than it really is.)

In the absence of an immediately available micrometer we made a search of photographs of Venus. Many of these showed the effect to a marked degree. On the other hand photographs of the Moon and Mercury sometimes showed a similar, **though lesser**, **effect. This suggested that photographic evidence in unreliable**. (*Author's note*: We will be addressing some of the problems in astronomical photography later).

By way of a test, we experimented on September 1, with untrained, and therefore unprejudiced, observers, selected at random. Some of them were strangers, collected, to their astonishment, from the beach at Selsey. None of these observers had any idea of what they were going to see; but were merely asked to look through the eyepiece and draw what they saw. **Making due allowance for variations in drawing ability**, **there was a clear tendency to see the effect observed by us**.

We had noticed also that a very low power made the phase apparently much smaller than it appeared with a higher power. Our random observers reproduced this effect dramatically; x50, they drew the planet as a thin crescent whereas x130 they saw it as anything up to a half circle. This peculiarity can be accounted for on the assumption that the effect we have described is valid. In very low power, the eye tends to notice the ratio of height to breadth, the image being too small to judge the shape of the terminator. With a large image, the slope of the terminator catches the eye at once and determines one's estimate of phase.

Since these observations were made, members of the section have been asked to keep a watch for the effect and make measurements when possible. Preliminary results suggest that the effect is fairly common; but certainly not permanent. They also suggest that it may be exaggerated in blue light and reduced in red.

The data at present available are insufficient to enable any firm conclusions to be drawn, but various lines of thought seem to be worth consideration. If the high albedo of Venus is due to lofty translucent

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> clouds against a background of darker clouds at a lower level, **there might be a tendency for increased reflectivity at the apparent poles**, **so that the cusps themselves might be accounted for in this way; and more-over the effects might well be extremely variable**, **and susceptible to changes in the conditions over Venus**. However, speculation is rather profitless until more evidence is forthcoming, and the present note is designed merely to draw attention to an effect which is, if confirmed, both interesting and puzzling.[4]

Brinton and Moore's experiments show that everyone sees the enhanced phase of Venus. They note that the cusps are extended beyond the polar regions. All this does is merely to complicate the answer to the problem: What is the actual phase of Venus? They state that:

> . . .there might be a tendency for **increased reflectivity at the apparent poles**, **so that the cusps themselves might be accounted for in this way; and moreover the effects might well be extremely variable**, **and susceptible to changes in the conditions over Venus.**

After all these experiments, Brinton and Moore are thus testifying to the fact that the Polar regions are much brighter than they should be. They also recognize that this brightness is considerably variable. These two astronomers are testifying to the existence of the "Horns of Venus." What they did not mention in the above is that these Horns could not possibly be lit by the Sun since they lie beyond where the terminator should be. What if the Horns are being lit by light from inside Venus? Or by a luminous Venusian atmosphere?

Let me emphasise the key issue here. Whenever astronomers speak of the Phase Anomaly of Venus, they keep emphasizing and concentrating on the Venusian terminator and the fact that it is wrongly placed. What they tend to skimp over so often is that the cusps are really the problem. Remember Figure 7.2, drawing (b)? What does it show? It shows that at dichotomy the terminator is indeed a straight line. What this is showing us is that at dichotomy the terminator does indeed match theory exactly. The problem is not the terminator. The problem lies at the cusps. It is the abnormal lighting of the cusps which extends beyond the semi-circle **into the night side of Venus** that is the problem. I too was fooled by this constant mention of the

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terminator. Look at the drawings, and see that the terminator is not the problem. It is these cusps which are lit for a distance beyond the semi-circle. Brinton and Moore did realize this, but they did not emphasize it enough. They held the solution to the problem right there in their hands.

Let me point out another simple and yet highly relevant fact. If the Venusian dichotomy occurs **late** one can then indeed point to some atmospheric phenomenon. Remember that the planet's orbit does not change. The planet is moving around the Sun exactly in accordance with expectations. The planet is in the right place at the right time. Hence the changing form of the planet is due to something on the planet itself. Now if the Venusian phase is retarded then one might have to look for dark matter in the atmosphere which is reducing some of its reflectivity. In other words part of the planet must be lit by the Sun, but for some reason it is too dark to see. But half the time the Venusian phase is accelerated. Parts of Venus are lighting up **before** it is in a position to receive light from the Sun. This is of critical importance. Brasch noted that the phase was accelerated by almost two weeks at times. Now how can we see parts of Venus where the Sun's light cannot possibly reach? Remember we're not seeing refracted light from behind the planet. We are seeing light emanating directly from the sun-lit portion of the planet. Clearly the planet is lit by more light than can be accounted for by the Sun alone. **Where is this light coming from?** As Brinton and Moore realized, and as can be seen in drawing (b) of Figure 7.2, the real problem is related to the unnatural lighting in the polar regions. **What is lighting up the Venusian poles?** Clearly, it is not just a case of bright aerosols in the upper atmosphere. No matter how reflective the aerosols are they will still not be seen if lit by the light of the Sun alone. They must therefore either be producing their own light or light from another source must be the culprit.

With regard to astronomical photography they write: "In the absence of an immediately available micrometer we made a search of photographs of Venus. Many of these showed the effect to a marked degree. On the other hand photographs of the Moon and Mercury sometimes showed a similar, though lesser, effect. This suggested that photographic evidence in unreliable."

The existence of photographs which show the Phase Anomaly of Venus proves that this is not a psychological phenomenon. They note that this occurs to a "lesser extent" on Mercury and the Moon. The important

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difference is that both the Moon and Mercury have dark and light areas on their surface which do not always show up. They thus appear to have irregular terminators. This is very evident in almost any Moon photo you could care to examine. One cannot compare the effects on the Moon and Mercury with what is happening on Venus. The Moon never shows a “cusp cap” larger than its phase dictates. If anything, the Moon, upon close examination will appear to have an irregular terminator caused by dark maria and craters. The Moon at Half-Moon phase, matches its expected phase exactly, all the time. Remember that the camera attached to the telescope is not as sensitive as the human eye. It is to be expected that it may not pick up areas which are badly lit. Since the Moon has maria one can expect this. The Moon actually does not have a high albedo. Its surface is quite dark. The Moon is much closer than the Earth and one can see its terminator in much greater detail than that of Mercury and Venus. Even with binoculars one can see the terminator varying but that is because we are so close and can see much finer detail. The changes on Venus are enormous. We have the entire polar regions lit up on an incredible scale. This is way beyond anything which is happening on the Moon. Anyway, we are drawn again to the terminator problem. The problem is not the terminator. The problem is the extension of the Venusian cusps. You will never see the Moon exhibiting the characteristics shown in Figure 7.2 drawing (b). You can prove this to yourself by taking a good look at it as it goes through its phases.

Mercury does sometimes exhibit slight terminator difficulties, but this could easily be a combination of dark areas as well as clouds of dust being whipped up on its surface. Mercury does undergo darkening and brightening as was mentioned in earlier chapters. But Mercury’s cusp caps do not extend into the night side. So the problem on Mercury and the Moon do not match what is happening on Venus.

With Venus, we are dealing with an atmospheric phenomenon, and one of the keys (which Brinton and Moore begin to recognise), is that the cusp caps extend beyond where the light of the Sun shines.

In a further attempt at solving the problem, E. L. Ellis suggested in 1974, that the Phase Anomaly was due to the distortion of the visible portion of Venus by its tidal bulge.[5]

I too had been obsessed with the equator. I also wondered about tidal bulge problems. It took quite a long time before the solution to the problem occurred to me. One keeps looking at the problem from the wrong angle.

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Ellis's suggestion deserves some attention because the answer is not easily obvious. I suggest the Reader take a few moments to perform a simple experiment. Take an egg. It has a nice smooth surface, and depending upon how you turn it, the side view changes. Put the egg on a table, and place a torch next to it. Switch on the torch and see where the "terminator" lies. Look down at the egg directly from above. The angle between you, the egg and the torch will be 90°. Hold the egg so that the pointed end is pointing away from you, and the blunt end is pointing towards you. The "terminator" will be seen to be a straight line. Now turn it so that the pointed end points towards you. Keep the angle of 90°. Again you will see that the terminator is a straight line.

There is no possible equatorial bulge on Venus which could come even close to the variations which occurred with the egg experiment. Yet, you have seen the "blunted" and "pointed" egg directly head-on as if at dichotomy. But what did you see? **In both cases the terminator at dichotomy is a perfectly straight line down the middle!**

Remember that the single most established fact in the problem is that **at dichotomy**, **the terminator is not straight.** Clearly no equatorial bulge can solve the problem.

If you want to see the terminator behaving strangely, then lie the egg on its side, with the blunted end facing your body, and the pointed end pointing away from it. Now slowly turn the egg through 360° and you will notice a point where the terminator will have a kink in it.

The lesson from this simple set of experiments is that as long as Venus is **symmetrical** (regardless of whether it is a flattened or oblate sphere), **at dichotomy**, **the terminator will always be a straight line.**

It does not matter how flattened Venus is. It could be as flattened as a discus, yet the terminator **at dichotomy would remain a straight line.** Now as the Reader will appreciate, one aspect of the problem of the Phase Anomaly of Venus is that **at dichotomy** the terminator is **not a straight line.**

There is one valid point as regards Ellis's suggestion. If Venus were a flattened sphere, its crescent phase would differ very slightly from what it should be. His explanation is applicable to times other than dichotomy. Such flattening of Venus would cause the crescent phase to lag slightly behind what it should be. However, as dichotomy approaches, the terminator would quickly "catch up" and form a straight line exactly as expected—exactly as show by conducting some egg experiments of your own.

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Another factor which Ellis's suggestion does not take into account is the highly variable nature of the problem. If only the Phase Anomaly was a simple problem of shape caused by a flattened sphere then this problem would have been solved a long time ago.

But as the Reader can see, the problem is at its most obvious at the time of dichotomy, and Ellis's explanation cannot account for this. Nor can it account for the variable nature of the problem.

Richard Baum suggested I take a look at a recent book by G. E. Hunt and Patrick Moore wherein they raise the issue of the "Schroter effect." They wrote:

> The time of actual dichotomy is not easy to define accurately, because the terminator seldom appears completely regular; generally it looks straight for several consecutive days, and even the various measuring devices which have been used do not help much. **Large discrepancies were noted now and then; a fortnight in 1927 according to McEwen and Lees**, **12 days in 1951 according to the American observers.**
>
> **C. Venter**. . . **[M.B.B.] Heath's own observations from 1927 to 1958 gave a general discrepancy of about 2 days**, **but sometimes reach 6 or 7 days**, **while the German astronomer W. Sandner gave an average of 4 days**.[6]

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Eastern Elongations		Western Elongations	
Year	Days early	Year	Days late
1956	4	1958	2
1957	4	1959	3
1959	6	1961	4
1961	8	1963	4.5
1962	12	1964	5
1964	7.3	1966	7.2
1965	8.2	1967	11.9
1967	5.9	1969	5.5
1969	5.8	1971	4.3
1970	11.1	1972	4.5
1972	5.8		

Constructed from data in: G. E. Hunt & P. Moore; *The Planet Venus*, Pg 65, 1982

Constructed from data in: G. E. Hunt & P. Moore; *The Planet Venus*, Page 65, 1982

They provided the data to the right which demonstrates the extent of the Phase Anomaly. From this data they concluded that eastern elongations were on average 7.1 days early while western elongations were on average 5.2 days late. Apart from the first few western elongations shown in the above table, there seems to be no pattern to the discrepancies.

It is of concern to me that this table should suggest that eastern elongations are always early and that the only unknown is the number of days. At the same time it suggests that western elongations are always late. Henry McEwen's measurements, and also the testimony of other astronomers quoted earlier show that this is not exactly correct. McEwen's accurate

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measurements showed that the pattern was much more random. Compare this table with Figure 7.3 and note how McEwen's measurements showed similarities between western and eastern elongations. McEwen's 900 micrometer measurements seem to have been the most thorough work done on the matter to date.

Could it be that the above table is an attempt to fit a square peg into a round hole? Since normal geometry and refraction cannot explain the Phase Anomaly, is this how the data becomes skewed until it eventually "fits"? Who knows.

There are a few observations which suggest that the Venusian terminator departs from being a straight line or a gentle curve. This does not seem to happen often, but it could play a small role in the mystery. On 23 Nov 1877, E. L. Trouvelot made a drawing of Venus which depicted the terminator as a gentle reverse-S curve. In the years: 1881–9 unusual curvature of the terminator was reported by Breen, Maedler, Niesten, and Stuyvaert. On 14th May, 1892, F. Porro of Turin Observatory, using an 11–inch refractor, saw the terminator humped in the center, with depressions on either side. In 1892, long, low swellings and depressions were seen along Venus's terminator by Alexander, Mascari, Poro, and Zona.

Perhaps dust storms on Venus affected its clouds and made them darker. The NASA photographs which we reviewed earlier definitely show that there can be quite considerable variability in Venusian reflectivity at the equator and especially at the poles. In 1910, Edgar Mathews wrote:

> I enclose a sketch of Venus taken on Jan. 28 at 1700 hrs., with the 3.5–in. Short's Gregorian, power 140. **The horns were sharp**. But what struck me was a broken line of light near the terminator, a little nearer to it than shown in the drawing, about 2" or less away commencing from the south horn. Has this been observed before?[7]

This sighting is fascinating. Firstly the "Horns were sharp", which implies that the polar regions were being lit abnormally. The broken line near the terminator is interesting. The broken line implies alternating light and dark areas. Were dust storms in progress at the Venusian equator? These observations of irregular terminators might indicate the awesome scale on which meteorological phenomenon operate in the thick Venusian atmosphere.

But the Phase Anomaly can be solved simply, and decisively, when we

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realize that the Venusian polar vortex is to blame. As Brinton and Moore noted themselves, one can have great difficulty in determining the exact phase of Venus. Why? What if an Inner Sun we re lighting up the Venusian polar regions? Based on all we have covered in these chapters, let us now take a look at all the different combinations of lighting effects which can take place on Venus. By understanding these we should have no difficulty explaining the Phase Anomaly.

In Figure 7.4 we see semi-circle C with the terminator as a straight line (regardless of whether Venus has a bulge or not). Note how the Horns, marked A and B protrude into the night side of Venus, into an area which cannot possibly be lit by the Sun. This cannot be accounted for by refraction otherwise other areas along the terminator would exhibit the same effect. This is exactly the same as Figure 7.2 drawing b. Could the horns in Figure 7.4 be the result of an Inner Sun lighting up the polar regions?

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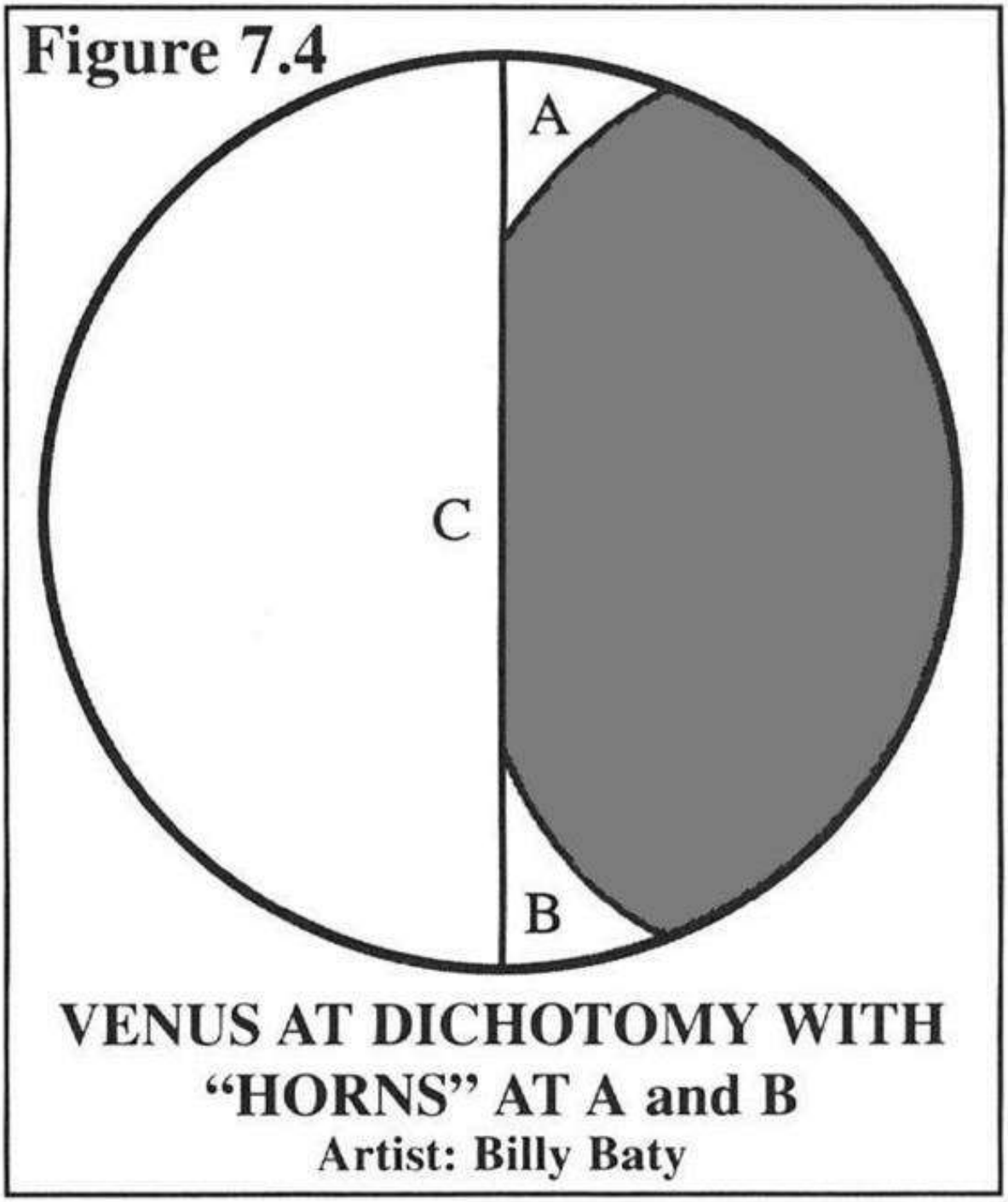

In Figure 7.5 we see what Venus would look like if only one horn were present—perhaps due to cloud cover differences which allow light to escape out of one Polar Hole but not the other. Now consider the problem an astronomer faces. When looking at Venus through his telescope, he does not see Venus pointing straight up like this. Depending on his latitude, Venus

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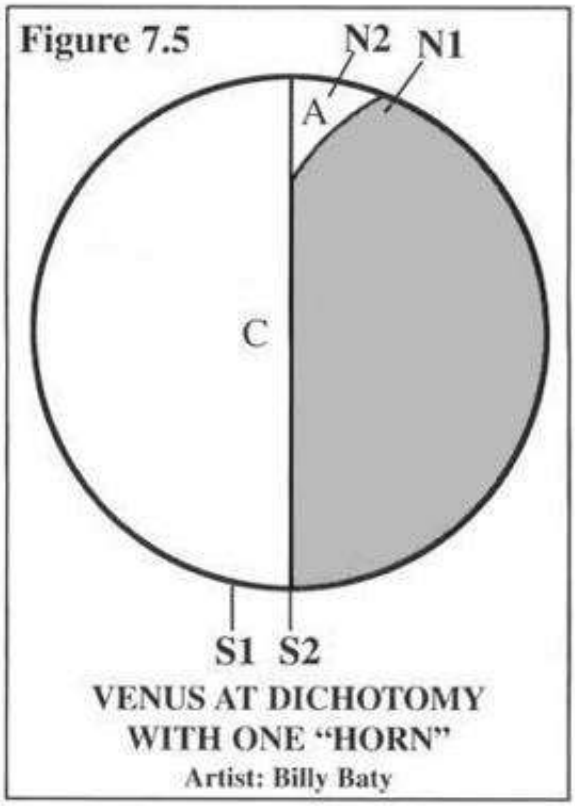
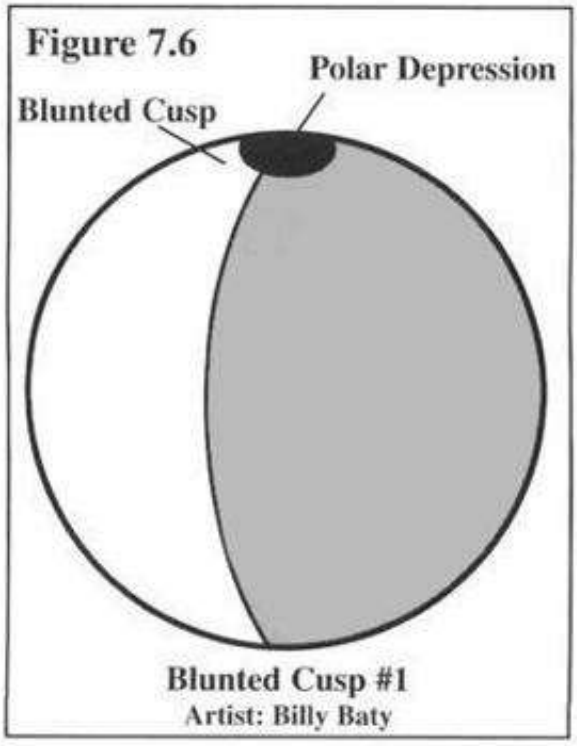
will be lying at a certain angle on its “side”.





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He would experience a problem determining exactly where north and south on Venus is. Would he match up N1 with S1 as the North and South Pole or would he match up N2 with S2? Visually he may experience quite a bit of confusion , especially since he is unaware of what is actually happening on Venus to deform it. What I am trying to point out are the visual difficulties an astronomer will experience trying to make sense of these strange phases. Instances such as this will make it extremely difficult for him to gauge the exact phase of Venus.

The blunted cusps on Venus might be caused either by air being sucked into Venus and the polar vortex falling a considerable distance. Or, more likely, dust-laden air blowing out over the polar regions darkening them and causing the Polar Hole and the surrounding region to become too dark to see. The effects of this can be seen in Figure 7.6. This would explain Schroter ’s observation where he drew a blunted cusp with a detached point of light far away. The point of light was simply an area not yet hidden by dust-laden air.

Figure 7.7 shows a phenomenon which is probably extremely difficult to detect. What if air is being sucked into Venus at one pole, while it is being expelled at the other pole? In this case, we would have a blunted cusp at one end and an extended horn at the other. It is highly unlikely an astronomer would realize the existence of the extended horn, since that end merely appears to end in a point, as all crescents do. I have no doubt that such a situation has occurred, but would be very difficult to detect. What this serves to illustrate is the difficulty of detecting all occurrences of horns. Horns are more easily detected at or near dichotomy when one can see that the terminator is not straight . Horns and anomalous lighting of Venus may be much more common than astronomers think. If there is only one extended horn at a time it would be nearly impossible to detect.

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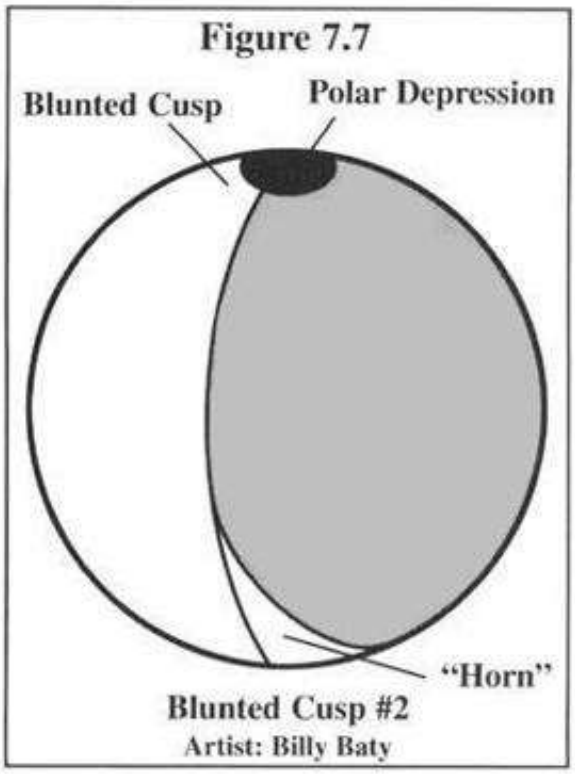

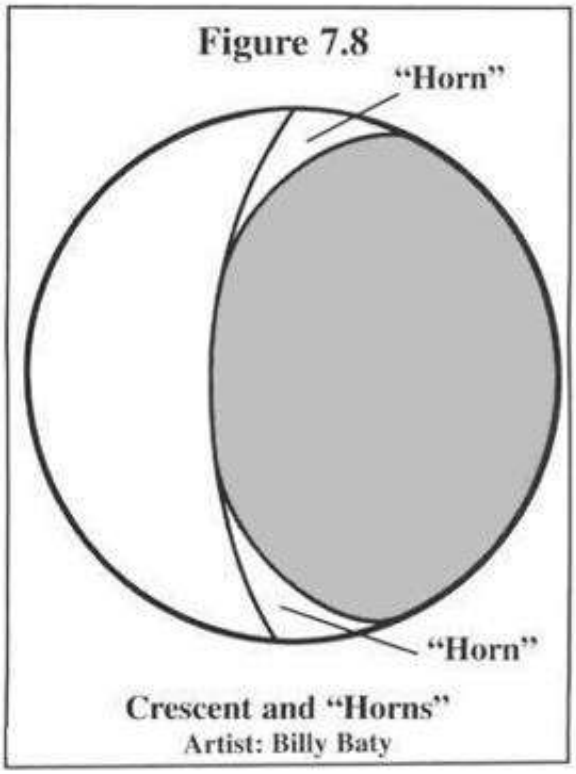

What happens when Venus is a crescent, far from dichotomy, and both

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horns are lit up? Such a case is illustrated in Figure 7.8, where we see the Venusian crescent extending beyond 180°. (Do not confuse this with the very thin ring of light caused by the Annular phase).

Detecting the above situation would be extremely difficult . Venus is a crescent, but the horns extend it. Yet, determining this would be extremely difficult, if not impossible. It may appear as if Venus is out of step with its theoretical phase.

This must be what Lewis Gibbs meant in 1890 when he wrote: "I desired to observe the prolongations of the cusps of the crescent of light, mentioned by several writers. . ."[8]

The descriptions by astronomers of Venusian "hooks" is the same phenomenon as depicted in Figure 7.8. The horns may appear thinner as Venus approaches the Earth and the crescent becomes thinner. Thus the horns may become transformed into thin hooks. Perhaps the annular phase helps to add to the hooked appearance.

When Venus is far away it appears gibbous. Due to its distance, it is difficult to see. The various depressions and horns of course apply to the gibbous phases as well. The horns will become more difficult to see since we are viewing the day-side of the planet which is already lit up. It would therefore be almost impossible to tell which parts of the polar regions are lit by the Sun and a central Sun, or luminous atmosphere.

I have attempted to show how the rise and fall of the polar vortex, along with the varying lighting and atmospheric movement from inner Venus can make Venus a nightmare as far as determining its phases goes.

The suggestions given here cover every aspect of the Phase Anomaly of Venus. Attempting to link the Phase Anomaly to phases alone is incorrect. All such attempts have failed. The rise and fall of the Venusian Polar vortex is governed by meteorological conditions both inside and outside the planet. Here on Earth the winds vary with the seasons. Why not on Venus? A pattern of some sort must exist. If so, no one has discovered it.

After studying the Phase Anomaly of Venus I felt that those simple diagrams of mine might be the key to understanding the Phase Anomaly in its entirety. Hollow Planet theory might be able to provide the solution to a problem which has plagued astronomers for more than two centuries.

An exceptional opportunity may exist to study the Inner Sun of Venus. One could engage in spectroscopic studies of the portions of the horns of Venus which can't possibly be lit by our Sun. Perhaps the light from the

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Inner Sun differs from normal sunlight? I would guess there must be differences. Scientists can tell a lot about stars and planets from spectroscopic studies alone. Such detailed studies of Venusian lighting effects may be the first steps in determining what is happening on that fascinating world.

Other meteorological phenomenon could be studied, such as the blunted cusps and the horns as well as the oxygen and nitrogen which cause the ashen light. One could infer a great deal about the movement of air into and out of the planet.

I think the Phase Anomaly represents the net effect of the behavior of one of the most bizarre hollow worlds in our solar system. I have brought together evidence from all manner of Venusian studies which might shed light on the most mysterious planet in our solar system.

I asked Richard Baum whether science had made any further progress in solving the Phase Anomaly problem. In an e-mail dated 11 April 1998 he replied as follows:

> In recent years some work has been done on this phenomenon, chiefly concerning its possible cause. As for the fact of its existence very little has progressed. **The phenomenon occurs**, **but in spite of numerous attempts at quantification nothing concrete has emerged**.

So, as Baum tells us, conventional astronomy still has not solved the problem. But here, in these few chapters we have examined the detailed lighting effects which might exist on and in, a hollow Venus. Using these ideas I have been able to make concrete suggestions as to why and how Venus “changes shape” and how the differing lighting effects will confuse astronomers. All these things taken together provide us with a detailed explanation of the Phase Anomaly of Venus.

Now ask yourself how someone like myself could even attempt to do this if I were armed with a false idea? Just look at how neatly the pieces are falling into place. Look at how solutions to one problem provide the solutions to the next problem? How could this possibly happen if Venus were not hollow and did not have two gigantic Polar Holes? But more is to come. . .

THE HOT POLAR CAPS

When the Pioneer Venus Orbiter flew over the Venusian poles, it discovered long elongated features stretching 4,000 km across both poles.

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These features are in an area where the Venusian Polar Holes should be. In 1983, Tim Schofield and Diner reported in *Nature*:

> The Venusian polar dipoles are long-lived, elongated, warm features seen in images of thermal emission from the polar cloud tops of the planet. They are almost 4000 km across, are centered close to the pole, and appear to rotate with a period of approximately 3 days retrograde.

The features were discovered by the Orbiter Infrared Radiometer on board the Pioneer Venus Orbiter. The features were only monitored for 72 days. They noted: "Its rotation rate is observed to change steadily over the 72 day data set, and **there is some evidence for oscillatory variations superimposed on this trend."** Oscillations? Air moving into and out of the planet perhaps? They found the dipole to be an elongated warm (bright) structure when seen directly from above. It extended down to 70° N and there were specific hot spots within it located at 75° N. A cool (dark) polar collar surrounded it and extended to 60° N. They found that although the dipole varied quite a bit from day to day, its **"gross appearance and rotation rate is fairly stable."** Schofield *et al.* did not know what caused the dipole. They wrote: ". . .the atmospheric structure responsible for the dipole is uncertain."

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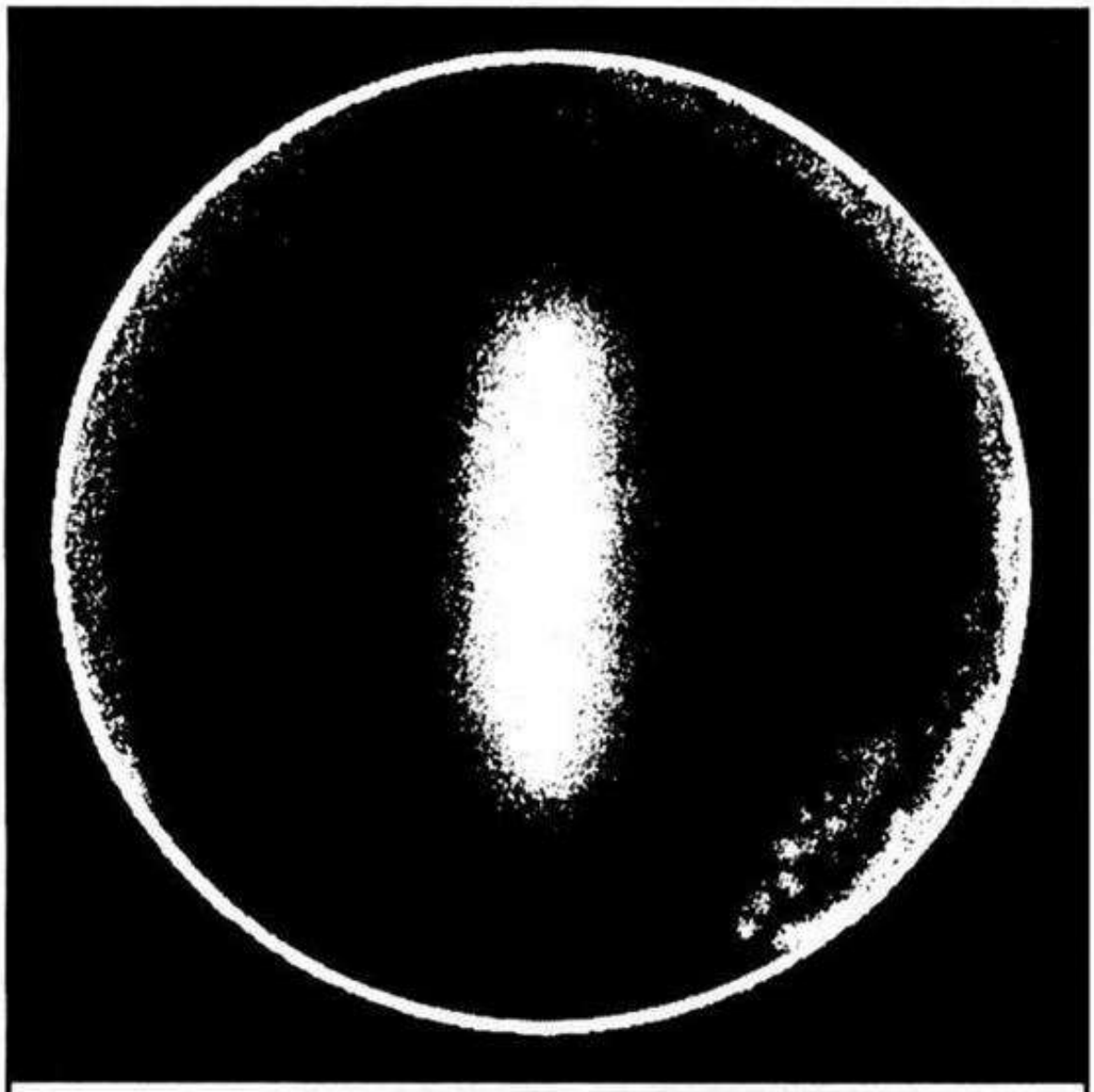

Figure 7.9

"Venusian Polar Dipole" Artist: Billy Baty

This feature does not appear in near Infrared, visible or UV wavelengths. So what is it? Schubert *et al.* believed that it was a temperature feature rather than a cloud feature. The dipole is very bright and the scientists are not sure if this is either cloud or heat or light or a combination of all three. All they note is that it is bright. Could it be that they are looking at something produced by a central Sun inside Venus? Other scientists reached this

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conclusion: “Kawabata *et al.* show that the poles are shrouded by a micrometer haze which could hide the dipole from reflected solar radiation, especially when the oblique angle angle of illumination is considered.”

We have come across something similar to this before. Remember the instances when bright polar caps were seen by astronomers from Earth? Remember how these caps sometimes extended into areas which could not possibly be receiving direct sunlight? That’s exactly the point Kawabata *et al.* have made above. Could this “hot” polar dipole be a close up view of the “bright” polar caps which astronomers have seen for so long? Could it be that the feature is bright and hot? But where would the heat and light come from since it lies in the polar regions of the planet? Could it be that this originates from inside the planet? The feature is not only bright, but there seems to be a “dent” in the polar cloud structure:

> Detailed comparisons of the data sets indicate that this [polar collar temperature] inversion fills and **the cloud top sinks as a dipole hot spot is approached**, suggesting that the dipole is a combination of temperature and cloud phenomenon.[9]

Guy Israel confirms the existence of this dent:

> The interest in the measurements made by the Pioneer Orbiter lies in the fact that the satellite passes vertically over the polar regions. By operating at a wavelength of 11.5 microns, where a narrow window in the infrared absorption spectrum of carbon dioxide gas exists, the temperature at the top of the clouds can be measured. It has in this way been shown that the previously held theory of a uniform distribution of the highest clouds around the planet, at a height of 68 km, was incorrect. **Over the North Pole a very distinct atmospheric depression**, **covering a large area**, **has been discovered. It shows up on infrared images in two ways: as a relatively dark circumpolar region lying between 53° and 70° N latitude**, **and experiencing low temperatures (205–225° K); and**, **as two bright connected zones**, **2**,**000 km long by 1**,**000 km wide**, **centered within a few degrees on the North Pole**, **and forming a polar dipole**. The brightness temperature which corresponds to the ‘eyes’ of the dipole is 250° K. At the level of the highest cloud layer, these temperatures are the highest ever observed at a wavelength

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> of 11.5 microns. The dipole is not stable in time. It has a very rapid rotational movement, with a period of 2.7 days. **Moreover**, **the circumpolar collar defines a region of the upper atmosphere which has a large temperature inversion**, **a difference of 50° K in comparison with much hotter equatorial regions. These polar phenomena are a consequence of a substantial local lowering of the altitude of the ceiling of the clouds; the difference amounts to about 15 km for the cloud layers where the 'eyes' of the dipole are found. Such a change in the relative uniformity of the clouds can only be attributed of phenomena associated with the dynamics of the atmosphere; this is also strongly suggested by the rapid rotation of the dipole**. The images transmitted by Mariner 10 in 1974, enabled us to prove the importance of vorticity in the Venusian atmosphere above the polar regions (polar vortex). Furthermore, the strong response of the general circulation **is illustrated by the extreme variability of the bright caps created by the thick mist of small sulphuric acid particles.**[10]

The polar cloud layer is 15 km lower than the rest of the Venusian atmosphere. Could this layer fall even more if air is being sucked into Venus? If so, would scientists believe their own instruments? I wouldn't be surprised if truly strange things occurred and they were explained away as instrument errors or something of the kind. If cloud levels were to fall violently and considerably for short periods of time would scientists take that seriously?

Tim Schofield was working at Oxford University when he wrote the paper regarding the dipole. I hunted him down to NASA where he now works and asked him some questions. Kindly note that 'VORTEX' is the name of the instrument on the probe which was used to observe the dipole. Here are some of his comments in an e-mail dated 2 Mar 1998:

> **We really do not know what the dipole is**, **because the vertical variation of temperature and cloud opacity at high latitudes is not well known.** There is evidence that the infrared cloud tops could be sharper (less diffuse) than at low latitudes, and they may be slightly lower in the atmosphere. **In the visible**, **the whole polar region is obscured by haze at higher levels. The dipole is surrounded by another dramatic feature known as the cold collar which seems to**

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> **be a deep cloud top temperature inversion**. (*Author's note:* That's an interesting comment he made about the polar haze which obscures everything in the polar regions.)
>
> **At the cloud tops**, **the atmosphere of Venus rotates with a period of roughly 4 days and spirals slowly northwards as it does so.** Air rises at low latitudes and must descend at high latitudes. **We do not know whether the dipole is a giant 'plug-hole' where air is descending**, **or whether air descends at slightly lower latitudes**, **and the dipole is simply a stable atmospheric wave or eddy.** The Dipole appeared to rotate with a period of 2.7 days, and seemed to be slowing down by about 10% during the 72 days that it was observed by **'VORTEX'. We still do not understand how the global circulation of Venus works."**
>
> **There is a polar collar and dipole in the southern hemisphere too**. This has been seen from Earth (greatly foreshortened), but could not be seen from 'VORTEX' because of limitations in viewing geometry. The northern and southern dipoles cannot be seen at the same time from Earth.

Schofield's comments are interesting. He speaks of the dipole as having the behavior of a "giant plug-hole." What if he is looking at a hole in the planet's crust? I asked some more questions. These were his answers from an e-mail dated 11 Mar 1998:

> Question: I was wondering what scientists know about the lower levels of the dipole. The idea of the winds rotating and moving further northwards into a "sink hole" is interesting. Have you seen winds blow back or outwards from the dipole? You've only mentioned the cloud moving northwards. Was that 72 day period the only time the dipole has ever been studied close or not?
>
> Answer: We really have not seen what happens below the infrared cloud tops (100 **mbar**, **65 km) in the polar regions of Venus. The winds are seen to blow poleward at the cloud tops (in addition to the 4 day circulation)**, **but it is not clear what they do at deeper levels. The winds should return to the equator**, **and some models predict several cells of poleward and equatorward moving air in the deep**

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atmosphere at different levels. The 72 day period when the 'VORTEX' instrument was working, is the only period when the form of the dipole has been studied close up, although infrared spectrometers on the Russian Venera 14 and 15 orbiters obtained some slices across the dipole.

Until now we only have the results of this 72 day study to go by and so there seems to be no evidence for air blowing out and away from the poles. At the same time however, they theorise that many cells exist where air circulates northwards, down and back again. But they do not have positive proof that the air currents truly follow this pattern. If some of this air were to flow into or out of an inner Venus they would be unaware of it.

Question: Is there a relationship between the dipole and the polar collar?

Answer: **The polar regions of Venus ought to be cold compared with the equator. However**, **the dipole is warmer than the equator**, **and the polar atmosphere above the cloud tops is warmer than the equator** up to 90 km due to descending air. The collar may be the edge of the cold region expected at the cloud tops at high latitudes, and **the warm dipole in the center is the anomaly. However**, **both features may be generated by poorly understood atmospheric circulation effects**.

Again, his reply suggests that there are many unknowns regarding Venusian atmospheric circulation. His comments above are truly strange. Air moving away from the equator can surely only be cooling down as it moves ever further away from direct sunlight. How can this air possibly become warmer as it moves further away from the equator? What if Venus is hollow and a tremendous amount of heat is escaping from inside it? Could this be why the polar dipole is hotter than the equator?

LIGHT BENEATH THE CLOUDS

Due to the thick Cytherean atmosphere, and its misty makeup, it was expected to be quite dark on the Venusian surface. In 1976 Keldysh wrote:

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> Another mystery in the Venera 9 pictures is the apparent shadows cast by the rocks. Avduevsky points out that as the lander descended it took continual measurements of the illumination from all sides. It recorded the sort of diffuse light expected under a cloud cover. 'Then it landed, and all of a sudden these shadows.' **If they are shadows**, **they would indicate a directed light source in the Venus atmosphere**, **possibly a rift in the clouds or something more exotic**. A facetious suggestion that got laughter all around was a Venusian standing over the lander with a floodlight. Marov points out that the black spots may not be shadows but depressions or differences in coloration of the surface. But then, why are they all on the same side of the lander and of the rocks?
>
> The Venus clouds turn out to be more tenuous than anybody had thought. Nephelometer measurements show them to be made of aerosols or droplets about one micron in size that appear to be something like sulfuric acid. Their concentration is about one or two parts per million of the CO_2 that is the major atmospheric constituent. So they are actually more like a haze than heavy clouds. As a result, the surface illumination is brighter than anyone expected, and photography is much easier there. With the Sun at a 30° angle from the zenith, the light flux at the surface is about 100 watts per square meter, an illuminacy of about 14,000 lux. 'This value corresponds to the illuminacy at the terrestrial mean latitude in the daytime with overcast clouds,' Keldysh writes.[11]

Another article in 1975 also questioned the Venera 9 photographs:

> An important question is why the surprisingly sharp rocks also seem to have surprisingly sharp shadows. If the Venusian atmosphere diffuses incoming sunlight as broadly as has been expected, why are not the shadows either faint or multidirectional if not completely absent?[12]

The above "explanation" is interesting. The scientists state that the cloud cover is more tenuous than expected, and then state that this explains the existence of shadows. Yet, one should keep in mind that you can't see the surface of Venus from above its atmosphere. It is never clear enough for the surface to be visible. How then can enough light penetrate to cause sharp shadows , all pointing in the same direction? Unfortunately, I do not know in

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which direction the lander was pointed when the photos were taken. Could it be that the directional light under the clouds of Venus comes from light refracted from inside the planet, and reflected off the bottoms of the clouds? Since we do not fully understand the refractive power of the Venusian atmosphere, this is one possibility which comes to mind which I doubt anyone has ever considered.

Note Marov's rather weak suggestion that the black spots might not be shadows. Clearly there is disbelief on the part of these scientists that a directed source of light exists on the Venusian surface. It does not make sense. Even if the Venusian clouds are thinner than expected the simple fact remains that from space one cannot see the Venusian surface. Even by their own estimations it will be the same as a day on Earth which is overcast. Have you seen sharp shadows on the ground around you on an overcast day?

A further study of the night side of Venus suggests that there is some sort of light/heat coming from beneath the clouds on the night side of the planet. In 1984, two Australian scientists, D. Allen and J. Crawford reported in *Nature*: "Observations of the dark side of the planet Venus at infrared wavelengths. . . **Have shown it to be anomalously bright in portions of this waveband."**

They tried to determine where the infrared radiation was coming from which sometimes covered the entire night side of Venus. It seemed reasonable to suppose that the light originated from the Sun—perhaps being refracted around the planet? They noted:

> The only other continuum source available is sunlight, which would have to be scattered from the illuminated hemisphere by the upper cloud layers. **Since our images show little indication of a fall in brightness away from the terminator**, the scattering could not be accompanied by significant absorption. **We note that if such a mechanism were operative at visible wavelengths the unilluminated side of Venus would be far from dark**. . . [we]. . . cannot offer a definitive explanation of the phenomenon.[13]

The images produced by Allen and Crawford do not show any reduction in the intensity of lighting far away from the Venusian terminator. The intensity of infrared radiation at the terminator is the same as that far away from the terminator towards the midnight sector. Could this indicate that the

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light is coming from another direction? From the surface of the polar regions? I say this because the six images presented in their paper always have the infrared radiation occurring in bands which lie parallel to the equator. Even when there is little infrared radiation, the “clouds” giving off this radiation stretch all the way to the midnight sector. In fact, the scientists admitted that “The nature of the cloud structure is far from certain.”

Could this mean that the light which produces the phenomenon comes from the North and South Poles of the planet thereby lighting up the cloud in broad bands at the same latitude?

They made the point that if visible wavelengths of light from the Sun were to be bent around the planet in a similar manner then the entire night side of Venus would not be dark! Could it be that this anomalous radiation emanates from inside Venus itself?

Could a Venusian Inner Sun light up parts of the outside of the planet when refractive conditions are right? Or is all this the result of disassociated atoms emanating from inside Venus?

THE “Y” and “W” MARKINGS ON VENUS

According to radar measurements Venus has a 243 day axial rotation. Measurements of a great many ultraviolet photographs of the cloud tops shows them rotating about the planet in a mere 4 days! This phenomenon is known as “super-rotation” and no one knows what causes it. Why should the clouds rotate about the planet faster than the planet itself? Where does the energy for this come from?

Cruikshank might have dismissed the Phase Anomaly as a valid problem, but he does agree that the super-rotation of the Venusian atmosphere is indeed a genuine mystery. In fact, all scientists agree that this is a great mystery. On 30 Oct 1997 he wrote to me as follows:

> **Venusian super-rotation is real and is not understood.** The entire phenomenon of super-rotation is of interest to planetary and Earth scientists; you may know that the core of the Earth is in slow super-rotation, and there may be other examples among the planets of the Solar System. Some very bright people are working to understand this phenomenon.

I couldn’t help but smile at his last sentence. Perhaps it’s a hint to people like

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myself to stay out of an arena I'm not trained for! I suppose it's a case of fools rushing in where angels fear to tread. So Dale Cruikshank agrees that this is a real mystery. It is well-documented and not a single viable explanation exists for it. Some very vague ideas have been proposed.

I think I can show that there is a connection between the Phase Anomaly of Venus and the super-rotation. The super-rotation was only discovered when satellites went to Venus. It turns out that the Earth's atmosphere has a far lesser degree of super-rotation as well.

Astronomers have struggled unsuccessfully for centuries to catch a glimpse of surface features below the thick Venusian clouds. In 1977, Harry Hunt reported the following exciting development in *Nature*:

> Planetary observations in ultraviolet light have provided the most exciting and unexpected result which still remains today as a major unsolved problem in Venusian meteorology. The upper atmosphere in the neighborhood of cloud tops super-rotates. Features in this region move in a retrograde manner with a rotational period of only 4 days which is incredibly short when compared with the planet's own solid-body retrograde rotation of 243 days. So Venus possesses the largest ratio between the atmospheric and planetary rotation rates of any body in our solar system.

Ultraviolet photographs taken in the 1960s showed the apparent movement of dark features in the Venusian atmosphere. These included the Y and W shapes which are centered on the equator.[14]

Some scientists wondered whether this movement was real. Young thought that super-rotation was an illusion. He suggested in 1975 that a travelling wave-like phenomenon moving around the planet with a phase velocity corresponding to a 4 day period might produce a similar effect.[15]

Traub and Carleton then conducted spectroscopic studies of the winds to see if the movement was real or not. The Russian Venera 8 space craft also conducted a Doppler drift experiment.[16] The results of these experiments provided strong evidence that the super-rotation was real and that the atmosphere was indeed moving very rapidly. The ultraviolet markings had an apparent equatorial speed of 100m/sec. The wind speeds measured in these experiments was large enough to account for most, and perhaps even all of this motion.

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Some scientists had wondered how persistent the Y and other atmospheric features were. Boyer and Guerin had suggested that the Y feature survives for decades at the same longitude in a coordinate system which rotates with a period of 4.067 days.[17]

In 1972 Beebe, Scott and Reese made an alternative proposal. They pointed out the short-comings of ground-based observations and went on to suggest that these atmospheric features appear at random longitudes. These features then dissipate over a period of 8–16 days.

The Mariner 10 flyby produced high resolution images which caused Dollfus to conclude that these features were representative of the more extensive time series of Earth-based measurements.[18]

In 1976 Belton *et al.* published the results of their studies. They classified the markings according to size. Small markings were defined as having dimensions of 100–500 km, while large scale markings had dimensions of approximately 1,000 km. They found that the smaller markings had lifetimes of 1.5–4 days, while the very large markings which were located between 45° latitude tended to persist for longer than 4 days. These large markings also seemed to have an apparent angular motion at the equator.[19] Hunt commented: "These observations suggested to Belton *et al.* that they and polar ring features seen in the images are both visible manifestations of propagating waves. Hunt wondered why the meteorology of the Venusian upper atmosphere should be so different to that of the Earth.

Leovy had suggested that super-rotation might be a natural consequence of solar heating on a planet with a slow rotation.[20] Hunt pointed out that: "**The super-rotation requires an efficient high altitude thermal forcing**, but for the Earth, the largest amount of available radiative energy is that absorbed at the surface."

Hunt conceded that the Earth's thermosphere also experiences some super-rotation as pointed out by King-Hele.[21;22] How long lived is the "Y" feature on Venus? Boyer and Guerin felt it could survive for decades, while Beebe, Scott and Reese felt it appeared at random and only lasted for 8–16 days. The "Y" feature is enormous, and covers almost half of Venus. What causes it? Nobody knows. As you can see from the above many scientists were struggling to explain it.

I think Beebe, Scott and Reese are right, and that the "Y" appears at random and then dissipates. But why should a "Y" form consistently? The "Y" is exactly the same size each time. Venus rotates so slowly and the "Y"

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races across the planet's surface. It is not linked to any geographical feature. But it is produced consistently. The "W" feature is equally mysterious. It too covers half the planet.

What if the "Y" and "W" features are both caused by the "breathing" of Venus? What if this breathing of Venus is driving the tremendous super-rotation of the planet's atmosphere? Currently, scientists are of the opinion that the atmosphere super-rotates, and therefore causes the polar phenomenon. What if it's the other way around?

What drives the super-rotation? Leovy had made the vague suggestion that this happens when heating tends to produce an equatorial thermal bulge which cannot develop instabilities because of slow rotation or large damping. The atmosphere then super-rotates at a high level. Wishful thinking?

Yet, Baum's radial spokes mirrors exactly the process which Leovy mentions. Hot air probably rises from the subsolar point and is being dissipated across the surface of Venus. Leovy's idea, if correct, would favor the existence of Venusian spokes as the driving force which drives the atmosphere. It does not seem as if it could be a strong force. Something tremendously strong is forcing the upper atmosphere to move around Venus in a mere 4 days, and it's taking the associated "Y" and "W" features with it.

I would now like to offer a suggestion as to what drives the super-rotation of the Venusian atmosphere, and what causes the "Y" and "W" features. Take a look at the following figures which illustrate the movement of air from the Venusian poles to the equator. What if air is pumped out of Inner Venus and it rushes out high in the atmosphere, equator-ward? See Figure 7.10.

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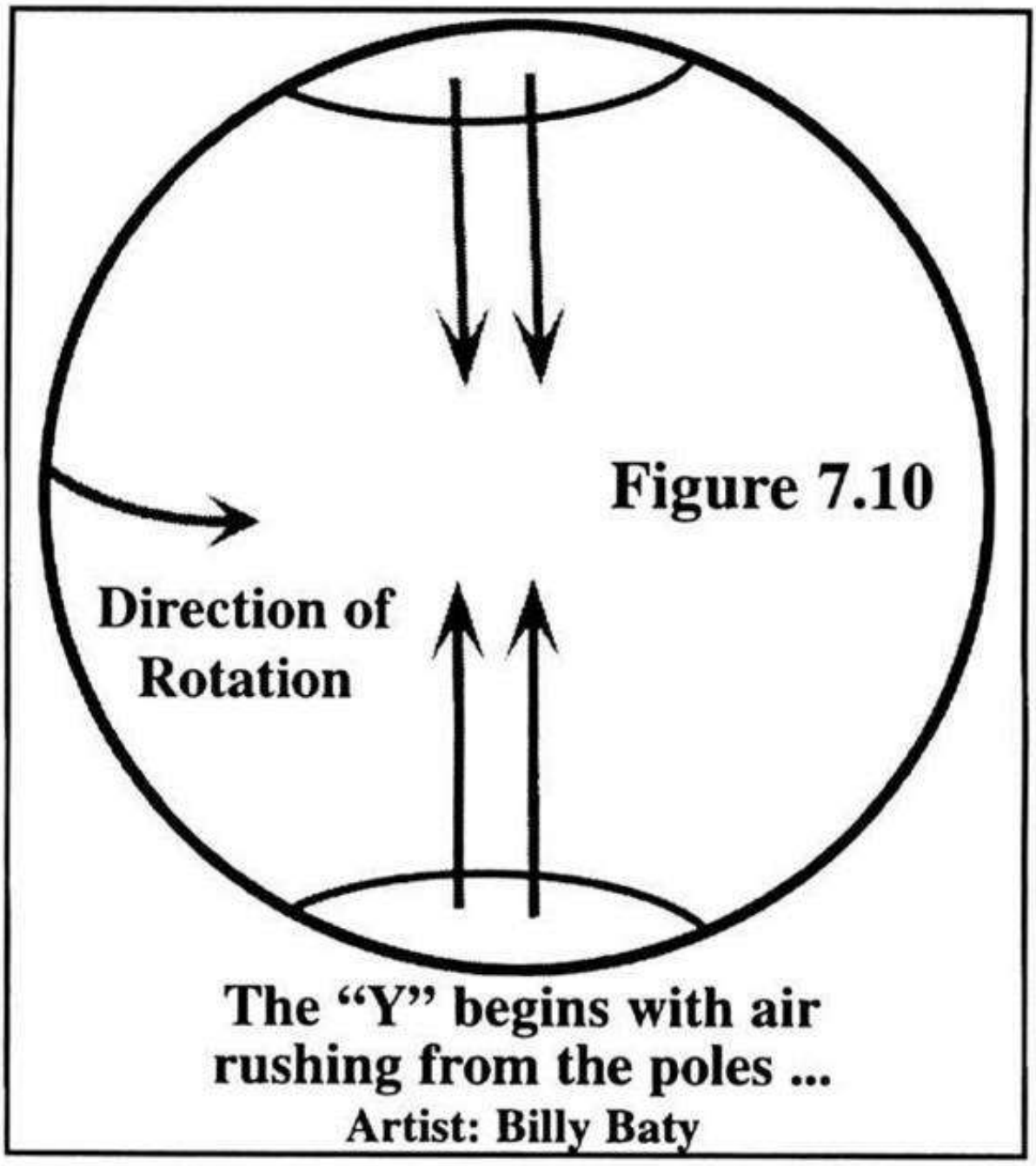

The rotation of Venus would then deflect the air in the direction in which the planet is rotating (Figure 7.11). Thus when the air currents from the north meet the air currents from the south, they have both been diverted in the same direction. This combines their strength and a powerful river of air rushes along the equator in the direction of the rotation of the planet.

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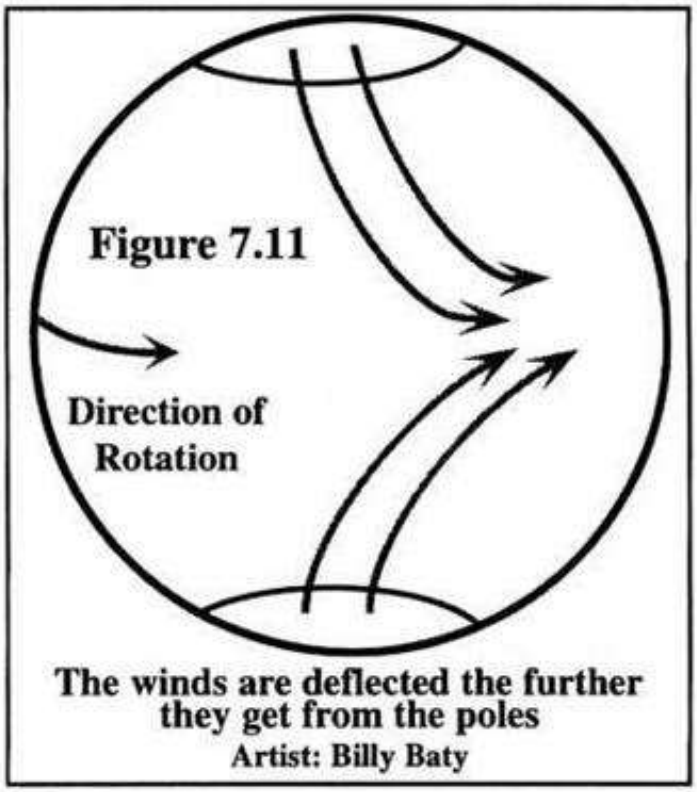
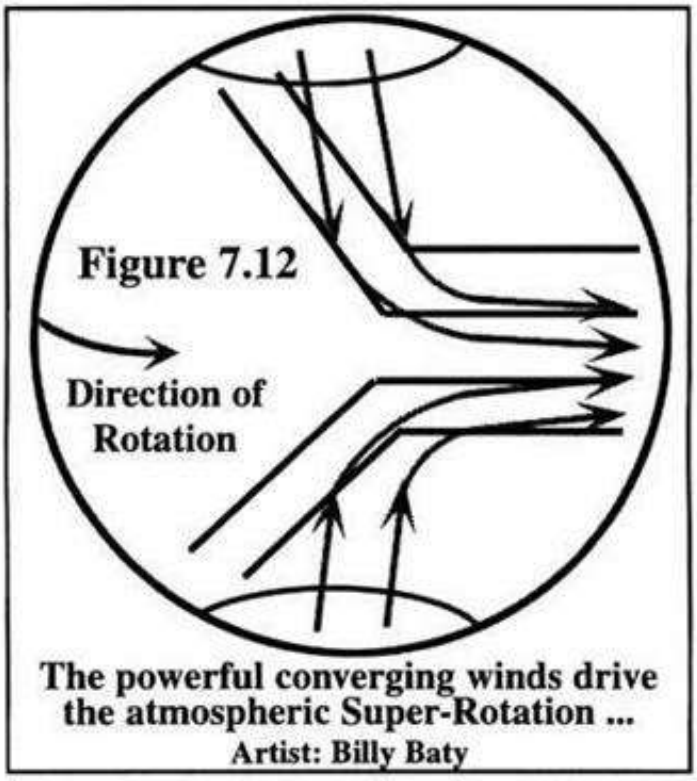


The winds are deflected the further they get from the poles
Artist: Billy Baty



The powerful converging winds drive the atmospheric Super-Rotation ...
Artist: Billy Baty

This powerful torrent of air then gives the atmosphere a hefty shove in

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the direction of the rotation of Venus (Figure 7.12.) Hence the atmosphere begins to flow faster than Venus rotates. It's as simple as that.

New questions come to mind. For example: Why does the "Y" cover approximately half of Venus? The "Y" covers one entire hemisphere (west to east). I think the "Y" shape is created on the night side of Venus. Meanwhile, on the day side, the following is happening:

Remember R. M. Baum's Radial spokes at the subsolar point? Hot air is rising at the subsolar point. Air currents are carrying away the hot air in all directions. The planetary and atmospheric rotation might deform the radial spokes so that they are especially elongated in the direction of the planet's rotation. Suddenly large masses of air come rushing out of the Polar Holes. They clash with air currents moving away from the equator. The rest of the atmosphere is super-rotating and the predominant effect is a push in the direction of the rotation of the planet. See Figure 7.13.

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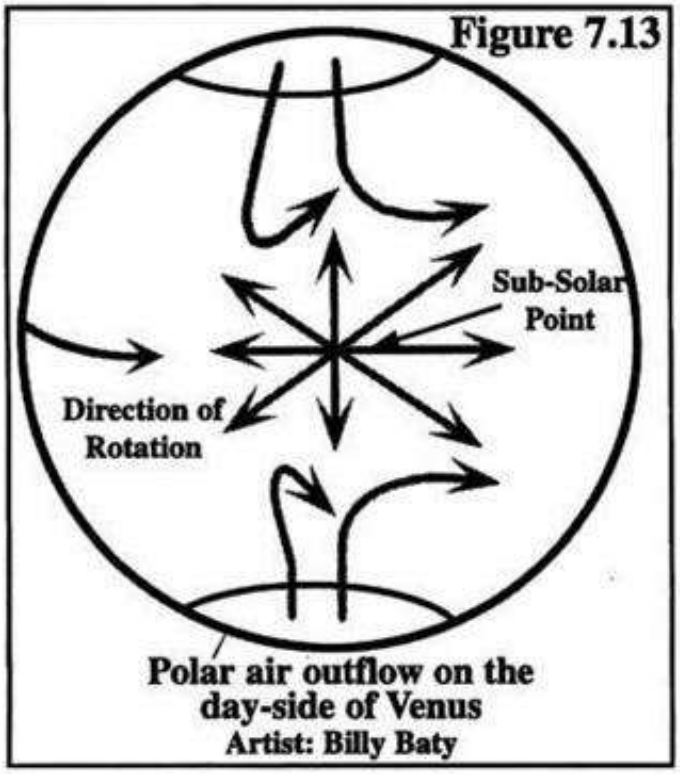

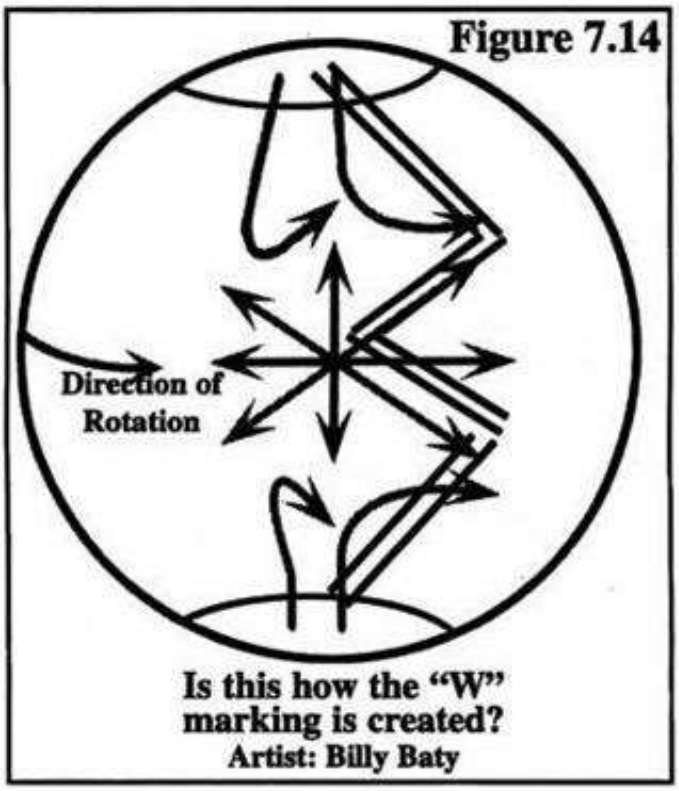

These colliding air currents then merge to form a “W” lying on its side.

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See Figure 7.14. Thus, I think the “Y” forms on the night side of Venus, and at the same time, a “W” forms on the day side. Both these dusky markings being the result

These formations are “one time” events. Air is not continually flowing out of Inner Venus (as we have noted with the telescopic observations). Strong air currents come out for short periods, and then it stops. The “Y” and “W” markings are then carried around the planet by the super-rotation which they helped create. The markings then slowly dissipate or are overcome by vigorous new outflows.

As the Reader should appreciate, the atmospheric conditions which create these two dusky markings are directly responsible for injecting the mechanical energy into the atmosphere which produces the super-rotation. The merging of the two polar air-streams at the equator pushes the atmosphere along faster. The formation of the “W” results in the same effect.

Then, for a period of time, nothing further happens. The inner and outer atmospheres are in equilibrium and the air currents gradually begin slowing down. This is until the next injection of energy, in the form of air, comes out of the inner cavity.

Let us suppose that air is later sucked into the inner part of Venus. Would this be responsible for an effect similar to water going down the drain? Would that perhaps be why the polar dipole spins even faster than the rest of the planet? Could it be that this sucking in and blowing out is responsible for all the weather on this very slowly rotating planet?

The “Y” is the most dominant and obvious feature in the Venusian atmosphere. I would guess that the meteorological conditions which create the “Y” probably inject more energy into the Venusian atmosphere at the equator than is true for the “W”. The “W” has less energy because it conflicts with some of the air emanating from the subsolar point which is moving against the rotation of the planet. It should be obvious that the “Y” marking is definitely not long lived, nor is it linked to any geographical feature (e.g. mountain range). It can’t be because it moves around the planet faster than the planet rotates. But the weather conditions which produce the “Y” will continue doing so at regular intervals whenever air is expelled from Inner Venus.

The “W” is less obvious because it is caused by the interaction of several air flows which weakens the final effect. This might help to explain why Baum’s radial spokes are so difficult to see. These radial spokes will be

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destroyed and disrupted whenever air flows out of Inner Venus.

The super-rotation of the Venusian atmosphere, as well as the high-speed rotation of the polar dipole might be the direct result of the north-south motion of air currents high in the atmosphere.

It should now be obvious why the “Y” and “W” markings cover half a hemisphere, because the one is formed on the day side and the other on the night-side. It all fits so perfectly doesn’t it?

Venusian meteorology is very simple because of the slow rotation of the planet. The Reader will now appreciate why scientists are having so much trouble solving the problem. That is because they fail to recognise the tremendous input of energy which comes from air rushing out of Inner Venus. If they recognized that there was an Inner atmosphere interacting with an outer atmosphere, then the solution to the problem would be very simple.

It is issues such as these which serve to fuel my own belief that planetary scientists themselves are not a part of the conspiracy to withhold data from us, since data has also been withheld from them. They have not realized that this planet is hollow, nor are they expecting it. Scientists have been fooled just as effectively as the rest of us. If they knew of the Polar Holes of Venus, and realized the implications then it would not take them long to solve these problems.

The Super-rotation of the Venusian atmosphere is a problem which has so far defied effective solution. These dusky markings, the “Y” and “W” might either be due to a different atmospheric content, or due to dust which was raised while passing through the Polar Holes. The various streaks seen near the Venusian cusps seem to be caused by the same air flow which causes these larger dusky markings.

WHEN VENUS BREATHES

An important theme so far has been that Venus “breathes” by way of air flowing into and out of an inner cavity. The amount of “breathing” is considerable. Enormous volumes of air probably flow into and out of this planet. There is a further aspect of super-rotation which needs to be mentioned. The rapid air-flow is taking place in the upper atmosphere. At ground level there is virtually no air-flow. This has been a mystery to scientists.

From all that has gone before, the Reader will now understand why

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super-rotation occurs, what fuels it, and why it is mainly an upper atmosphere phenomenon. This is because of huge volumes of air rising out of Polar Holes which form a slight bulge, and then flow equator-ward. Hence super-rotation is mainly a problem of the upper atmosphere. The cloud tops are carried around the planet by 360 km/hr winds while there is an absence of wind on the surface of the planet. This dilemma has caused scientists to debate over the validity of various data because it makes so little sense in their solid-planet models. In 1980, V. A. Firsoff wrote:

> **The contradiction between the short atmospheric and the long radar axial period remains unresolved. The Pioneer data add to its difficulty inasmuch as all the recorded air movements are substantially from east to west. Since such movements arise from coriolis forces**, **this would imply that all atmospheric flow is from the equator to the poles**, **which is absurd and is not borne out by the simultaneous records of meridional air flow** . It is suggested that the origin of the scale is wrong, and the true axial period is close to four days, the radar period originating in a counter-rotating belt of plasma.[23]

From the above one can see that the Pioneer data supports the east-west motion of the Venusian clouds. This is because of the collision of atmospheric currents emanating from both Polar Holes at the same time. Firsoff is in such a quandary that he suggests that perhaps the planet really is rotating once every 4 days and that the radar data is wrong.

In the above quote we find mention of the “absurd” possibility that all atmospheric flow is from the equator to the poles. It is immediately refuted and various errors are suggested. Evidently when Pioneer was at Venus, most of the airflow was predominantly in one direction. If the Reader will cast his mind back to Schroter’s southern hook, he will remember that it lasted for a month. Could it be that when Pioneer was there, that airflow was predominantly in one direction? Where could such enormous volumes of air flow to, without any air flowing back? Obviously, none of them would have imagined in their wildest dreams all this air was flowing into holes at the Venusian poles and disappearing into the interior! In 1980 Richard Kerr wrote:

> Unlike the study of Venus’s surface, the study of some aspects of its

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> atmosphere has been stymied by insufficient or **irreconcilable data. The 360 km/h winds that carry the cloud tops around the entire planet in 4 days have fascinated researchers for years**, **but the dozen U.S. and Soviet probes that have penetrated the atmosphere and thousands of U.S. cloud photographs have not revealed what drives the winds**. (*Author's note*: Kerr mentions "irreconcilable data.")

Scientists believe that Venusian meteorology is driven by huge conveyor-belt-like eddies known as Hadley cells which carry hot air from the equator towards the poles. However, since these have winds have not yet been detected, the scientists have concluded that they must be moving very slowly at lower levels. They theorise that somehow these two cells are kept separate, one above the other. Kerr continues: "In fact no winds in any direction have been reliably detected below an altitude of 10 km, where 50% of the atmosphere's mass lies." [24]

It is interesting to note that although they have theorized about these Hadley cells which must be carrying air back from the poles there is no hard evidence that this is so. Furthermore, if hot air was being carried from the equator to the poles, then why did Pioneer Venus Orbiter discover a dipole that was hotter than the equator? This seems to contradict the idea of Hadley cells.

Several decades ago Gerard Kuiper discovered that there were daily fluctuations in the infrared spectrum of Venus. No one knew why this was occurring. L. G. Young *et al.* from Caltech's Jet Propulsion Laboratory, (JPL) studied the Venusian spectra nightly during the autumn of 1972. Their study was reported in the *Astrophysical Journal*:

> Astronomers are well enough acquainted with periodic variations in the light from the stars, but a variable planet is quite a different matter. **However**, **the planet Venus shows regular changes in the spectrum of its atmosphere**, **according to four scientists at Caltech's JPL. The strengths of CO_2 lines in the Venusian atmosphere swing through a 4–day cycle**.[25]

Could this mean that the atmosphere inside Venus is different to the atmosphere on the outside of the planet? Could airflow into and out of the planet be causing this variable spectrum? Is the atmosphere being changed by

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something inside the planet? Is an Inner Sun changing the chemistry of the atmosphere in some way? The *New Scientist* also reported on this study:

> Their data on the CO_2 line show an unmistakable oscillation. "The observed variation is not exactly periodic, but more akin to a relaxation oscillation in which the amplitude builds up on successive cycles and then suddenly collapses. In order to produce the observed changes the cloud deck of Venus must be moving up and down by as much as 1 km, simultaneously over the entire surface of the planet. Such a large atmospheric oscillation requires a high input of mechanical energy. This condition is difficult to account for in the case of a slowly rotating planet heated uniformly by the Sun's rays. Therefore the cycle variations point to some unexplained deep seated property of the atmospheric dynamics.[26]

On the one hand we know that the Venusian atmosphere rotates about the planet in 4 days. Now there is spectroscopic evidence of a 4 day cycle in CO_2 absorption. We have speculated about the mass movement of the Venusian atmosphere in cycles to and from the poles. We also have the visual evidence from Astronomers to confirm that the breathing could be driven by a rise and fall in polar vortex. The CO_2 absorption lines indicate that the entire atmosphere rises and falls by 1 km every 4 days. Plus there seems to be no fixed mechanism to account for this since the planet rotates very slowly.

These scientists admit that there is a tremendous input of mechanical energy into the atmosphere. Yet at the same time they fail to recognize that they are looking at the solution to the super-rotation problem. Where they are really stymied is that they do not have a theoretical basis from which to deduce where the mechanical energy is coming from. The closest they come to a solution is to suggest a "deep seated" mechanism.

All the above taken together indicates that the entire Venusian atmosphere in a given hemisphere moves to and from the polar regions. What makes it difficult to detect is that the entire atmosphere is affected and it moves quite slowly. Some of the air is sucked into this hole which causes the entire outer atmosphere to be lowered by 1 km. The only reason the entire Venusian atmosphere can move up and down like this is if it is being sucked into a hole and then expelled later.

On Earth various folklore has reflected a link between the existence of

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the aurora and the weather. On Earth, as on Venus, the weather on the outside of the planet may be linked in part to the behavior of an Inner Sun. A rise and fall of 1 km in the Venusian atmosphere means that 115 million mi^3 of air is being sucked into Venus and then being expelled. This corresponds to approximately 1.1% of the total outer Venusian atmosphere.

Since the Venusian atmosphere rotates about the planet in a mere 4 days, and the breathing also occurs in cycles of 4 days, it would seem that all of this must be driven in some way by an Inner Sun. In the above excerpts one of the questions raised by scientists is: Where does the mechanical energy come from? The Inner Sun's activities seem to be the basis for this. Exactly how is somewhat of a mystery. There seems to be some sort of pressure balancing act going on between Inner and Outer Venus which is the cause for this strange cycle.

There may be more complex issues at work as well. Does an inner Sun actually transform part of the Venusian atmosphere in some way? Why does the CO_2 cycle build-up and then collapse? What happens to air inside the planet? Is oxygen and/or nitrogen created inside the planet? Or is the atmosphere somehow "sorted" by density? Does oxygen exist deep inside Venus and does it stay there much of the time? And the same for nitrogen? These are really complex mysteries. Then again Venus is a mysterious planet.

Has anyone ever seen Venus "blowing" luminous air out of its interior? Take a close look at this excellent recent account sent to me by Richard Baum. It is essentially an observation of something akin to the polar hoods except that in this instance the atmosphere seems to be rising! Take a look at this.

In 1985 Thomas Dobbins of Coshocton, Ohio saw two strange spots on Venus which were extremely bright and which seemed to bulge beyond its limb. At the time no other astronomers came forward to confirm the sighting and so it was ignored. It was later discovered that David Greenwood in England had seen the same thing.

Greenwood had been observing the ashen light which was lighting up the night side of Venus when he saw an enormous bright projection which appeared to go beyond the limb of the planet (See A in Figure 7.15). Dobbins not only saw spot A, but a much smaller one, B. Richard Baum, writing in the *Journal of the British Astronomical Association*, describes A as ". . . a highly luminous spot projecting beyond the limb of the planet." Dobbins does not believe that these features actually moved beyond the limb of the planet, and

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he may well be right. But since I have been speculating on the possibility that Venus may be physically breathing, it would seem foolish to ignore the possibility that maybe this sighting does represent something real. Dobbins expressed the view that the spots “were so brilliant that irradiation made them appear to deform the preceding limb.”

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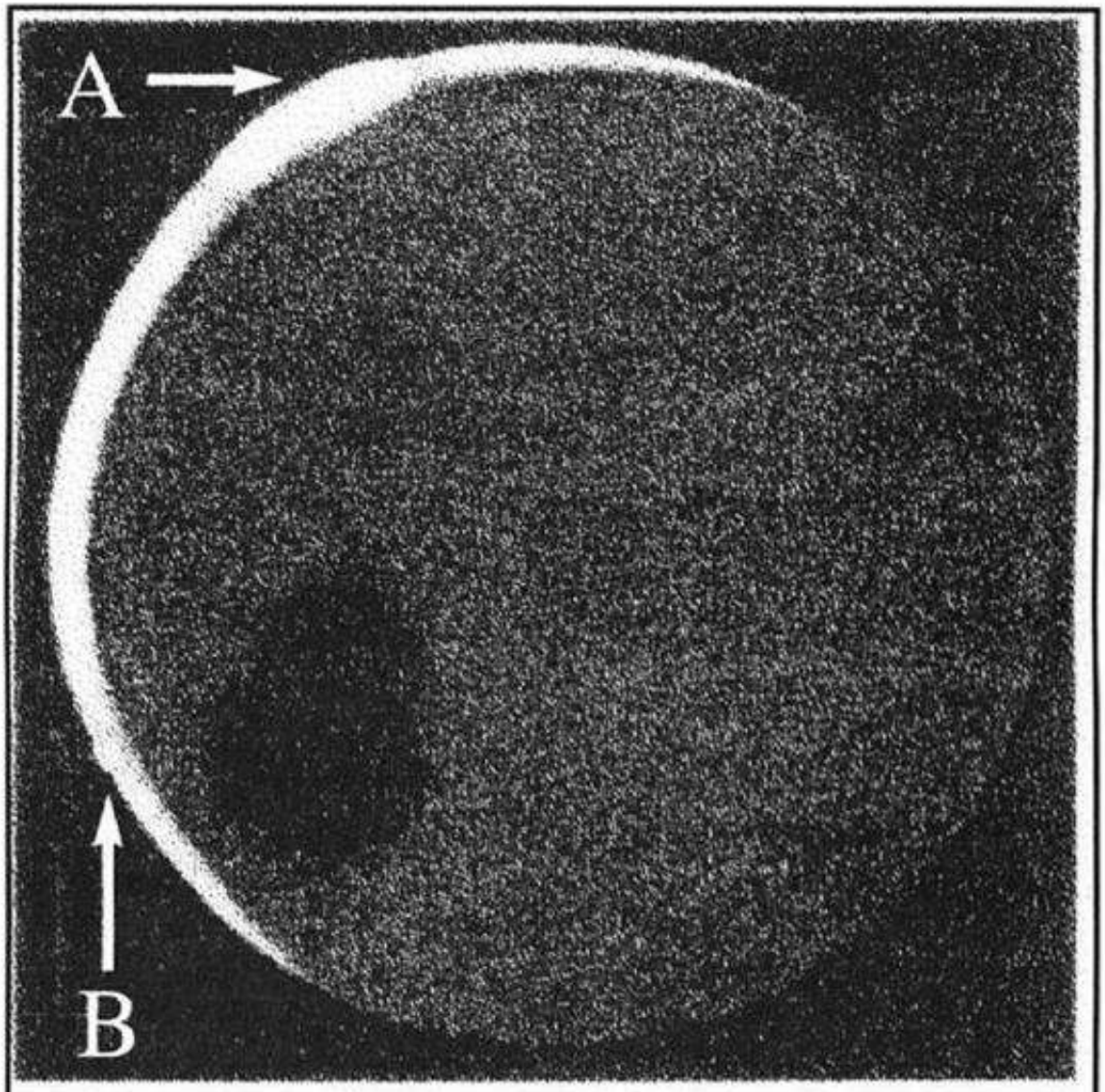

Figure 7.15

Luminous projection beyond Venusian Limb Observed by T.A. Dobbins 18th - 19th March 1985. *Journal of the British Astronomical Association*, 106:181, 1996

Could it be that air from inside Venus is naturally luminous due to an

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excessively active central Sun? Could it be that concentrations of such air causes bright spots on the outside of the planet and these concentrations fade as this luminous air spreads evenly across the outer surface of the planet? Note that both Dobbins and Greenwood observed the ashen light across the entire night side of the planet at that time. Could it be that the large luminous spot, A, in the north was the result of enormous amounts of luminous atmosphere being expelled from the planet and that this was also causing the ashen light at the same time?

What if the deformation of the limb truly was real? What if air was being thrust out of Venus forcefully thereby helping to fuel the super-rotation? Richard Baum commented:

> Although it has taken eleven years to surface and even then quite by accident, verification of Greenwood's observation carries one important implication: the value it places on continued earth-based monitoring of Venus by traditional and electronic means. . . **the observation suggests that some part of what we see through the telescope is intrinsically real; that in itself is sufficient justification to encourage visual observers to closer and more sustained scrutiny of the planet**.[27]

The above sighting might be real because in 1997 Baum came upon what might be the first photographic evidence of a projection beyond the planet's limb. Some CCD images of Venus were taken on 4 Oct 1996 by Luigi Testa, Secretary of the Planet Section, Unione Astrofili Italiani. Baum writes:

> . . . they show projecting above the mean contour of the northern limb, a distinct white patch not unlike the phenomenon reported by Greenwood and Dobbins in March 1985.

This can be seen in Figure 7.16 where an obvious bulge is visible in the curvature of Venus.

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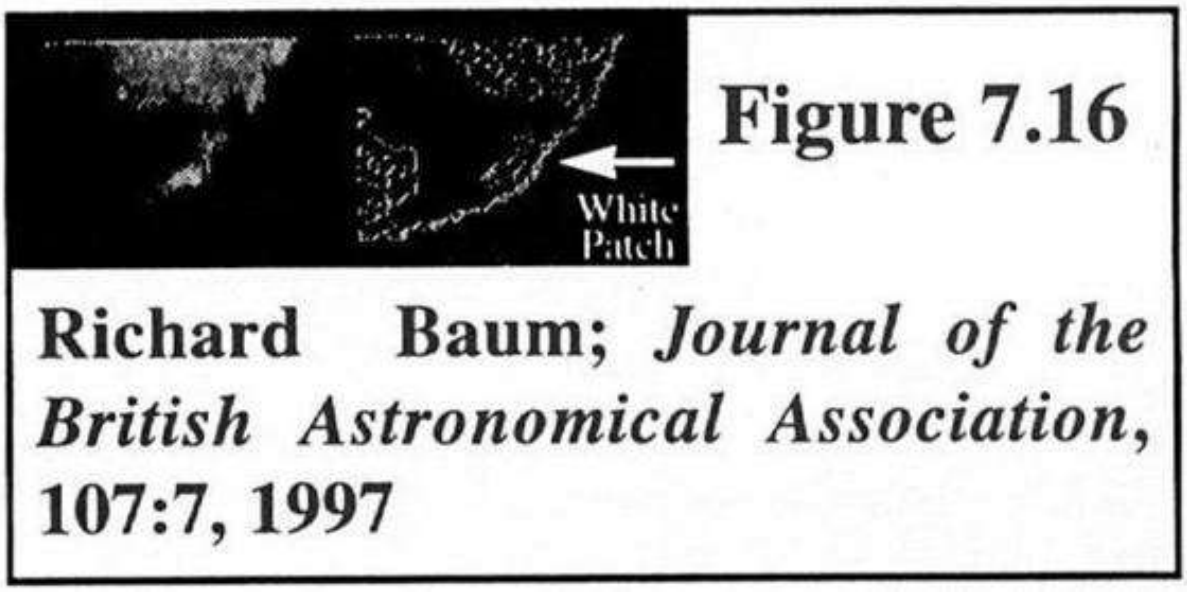

The images were processed and enlarged. It was discovered that a white patch white patch on the northern limb was projecting beyond the limb. It was still there in frames taken ten minutes later. Baum writes:

> We may reasonably conclude therefore, that the phenomenon, whatever its cause, had an objective reality and occurred at the planet.[28]

It may be worth going back to Gruithuisen's original discovery of polar hoods in 1813. This original discovery made with a small telescope illustrates a great many of the points I have been trying to make:

> 'I should not have discovered them,' Gruithuisen reflected in 1842, 'had I not had the small 1.5 foot refractor with me on 29 Dec. 1813.' In this instrument, between 3 and 4 o'clock, with the planet at culmination, he noted the **somewhat swollen appearance of its southern horn. 'It was this which led me to the discovery of the polar spots,' he tells us. Switching to a larger refractor at a power of x135, he saw two very small round bright spots near the southern horn. A similar spot in the vicinity of the North Pole gave the impression of being an actual projection.** 'Around 5 in the afternoon the north polar spot was more distinct than it had been two hours earlier, while at the South Pole the bright spot no longer showed as two distinct parts.' That same month, on the 30th and the 31st, the south spot was again clearly seen. On 3 January it looked oval, indeed **just like the polar caps of Mars**.

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Gruithuisen had many ongoing sightings of these polar spots as they appeared, disappeared, split in two, changed shape, etc. He established that these spots seemed to have an unusual affinity for the Venusian poles. Richard Baum explains: “From their brilliance and immobility Gruithuisen concluded the spots were truly polar, and by continued observation attempted to determine the planet’s axial tilt. . . Gruithuisen explained:

> . . . to my great satisfaction, I concluded that the midpoint of the polar spots is never found beyond a line that is at most 15° outside of a line drawn between the horns. . .

Gruithuisen was convinced that these spots represented the true axial tilt of Venus.[29]

I would like to draw the Reader’s attention to Gruithuisen’s observation that the southern horn was “swollen” and that he observed spots at both poles simultaneously. It seems as if there may be times when air is expelled from both poles at the same time. The polar hoods of Venus are still seen to this day. In Figure 7.17 are three drawings by Richard Baum done in 1956 using a 4.5 inch refractor with a magnification of 100.

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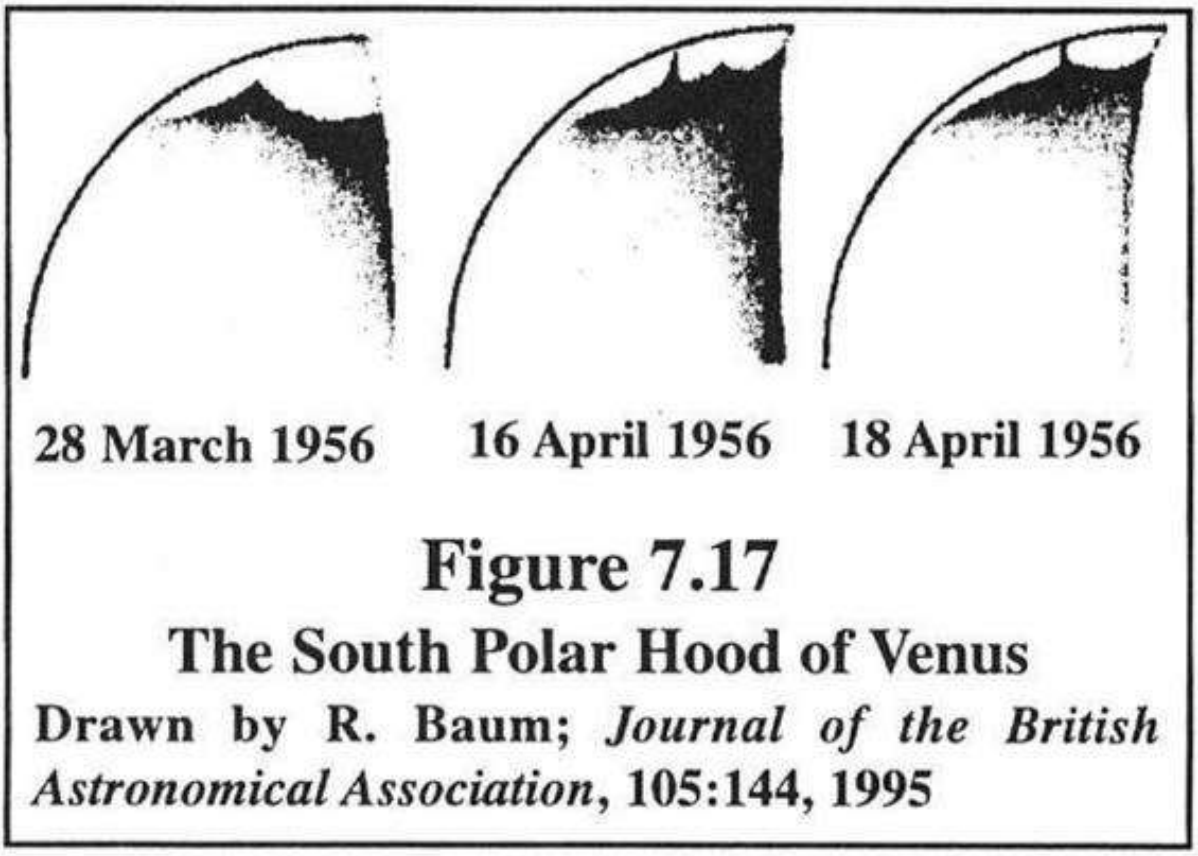

Figure 7.17
The South Polar Hood of Venus
Drawn by R. Baum; *Journal of the British Astronomical Association*, 105:144, 1995

CONCLUSION

Gruithuisen explained why others had not discovered the polar hoods before him:

> 'I attempted to investigate whether the bright polar spots were more readily recognized in small or large telescopes. I therefore looked at Venus with 5 foot, 2.5 foot, and 1.5 foot refractors, and found that the polar spots were more easily seen in the smallest telescopes than in the largest. This led me to suspect that this was the reason earlier observers had failed to discover them, despite having larger telescopes with powerful light grasp. In general such telescopes, because of the indistinctness of their images, hardly serve to reveal subtle differences of shade.

Gruithuisen's conclusions may apply to satellite photographs to a certain extent.

The issue of small versus large telescopes raised by Gruithuisen still dog

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astronomy. In my discussions with Richard Baum he expressed a certain dissatisfaction that professional scientists tended to ignore a number of sound astronomical observations of Mercury and Venus. This is a theme he echoes not only in his e-mails but also in his various contributions to journals and books. Baum does not of course think in terms of Hollow Planets. Nor does anyone else. That is merely an idea I have been digging into. One can nevertheless see that Baum takes these different sightings very seriously. He does not venture to state what they might be, but he clearly feels that something strange is happening on Venus and Mercury. He makes the following remarks:

> Today there is much discussion about objectivity in observation and the **subordination of observation to theory. It is therefore surprising to note how well his [Gruithuisen's] observations compare with reality.**[30]

Throughout this book we will be asking this question time and again: How closely does reality conform with theory? Are these theoretical expectations really properly fulfilled? Time and again scientists in various fields think it is so. But there are many instances where I wonder. Baum is one of the very few who feels that theory tends to override observations which might be real. He thinks that something valuable is being lost in the process. I wholeheartedly agree with him. Astronomers are far too conditioned to think in terms of solid planets and they may be ignoring subtle, yet crucial hints that something very abnormal is occurring on these neighboring worlds. Some of these things may be so abnormal as to make them believe they are seeing illusions.

My analysis of Venusian atmospheric phenomena left me wondering if we were witnessing a most magnificent hollow world in action. Venus is a breathing planet which would have done Halley proud. The simple logic suggested in these chapters explains virtually every aspect of Venusian atmospheric phenomena. All of it, every ounce of it, revolves around one single concept: Hollow Planets. Surely this data fit cannot be accidental? I never invented the data. The data was there all along. It took me years to piece all this together. I would be most honored if some astronomer somewhere would look into it.

But if Venus is hollow then where are these gigantic holes which should

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be there? Is there some sort of Government conspiracy to hide them? I wanted to see how the data fitted Hollow Planet theory. If the fit was very good then it did not matter that there were no photographs of planetary Polar Holes. It may simply mean that someone is hiding something.

When the first Magellan images of the Venusian surface were released the polar regions were the only areas not mapped. Could it be that the U.S. and Russian Governments already knew Venus was hollow (or suspected it might be)? Did they need time to analyze the Venusian surface so they could invent reasonably credible terrain in the vicinity of the Venusian Polar Holes, in order to fool the scientists? Remember one cannot see the surface of Venus at all. Even radar images from Earth have a very low resolution. There is no way we would ever be able to show that their surface was imaginary. Another tack may be to analyze the light from the Venusian horns. Perhaps we can determine if this part of the planet is luminous, and if the light from it comes from the Sun or from another star. More detailed studies of the Phase Anomaly and the creation of the “Y” and “W” formations should tell us a considerable amount about atmospheric flow into and out of hollow Venus. Studies such as these should then confirm whether Venus is hollow. Maybe new experiments can be thought of to try to detect these holes. Could radar perhaps detect these holes beneath the cloud cover?

If the United States and Russian Governments have been lying to us all then this may be the perfect opportunity to catch them at it. The Russians have had an exceptional interest in Venus. Between them they have sent more probes to Venus than to any other planet in the solar system. Perhaps these two super-powers know more about Venus than they are willing to tell.

But, no matter how much they may manipulate images of the planet’s surface to hide Polar Holes, they cannot meddle with the history of astronomy and with the satellite and telescope data regarding the planet’s meteorology.

Scientists are undoubtedly convinced by Earth’s seismology that all planets are solid. They may have ignored vital evidence which might have warned them that something was amiss on Venus. It seems to me that all that had to be hidden from them were planetary Polar Holes. By keeping this single key piece of evidence from them, the scientists then found alternative explanations which were in line with solid planet theory.

So many people have cried wolf and discredited themselves with conspiracy theories. I have placed serious, concrete, testable suggestions on

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the table and will suggest many more which can be carried out here on Earth too. With a bit of effort we should quickly be able to establish whether anything is being hidden from us or not.

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Part III: The Earth

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Chapter 8: Doubting the Dynamo

Scientists have known for hundreds of years that the Earth's magnetic field originates from the center of the Earth. It was demonstrated that the Earth's magnetic field is similar to a bar magnet placed at the center of the Earth. But what causes this magnetic field?

HALLEY AND EULER ON THE EARTH'S MAGNETISM

As we have seen, it is Halley's original, detailed, studies of the Earth's magnetism which resulted in him formulating the concentric spheres theory as a possible explanation. In the *Letters of Euler on Natural Philosophy* Euler writes quite a lot about the Earth's magnetism.

Euler's discourses led him to explain the problems of navigation, and of determining latitude and longitude. At that time, the problem of determining one's longitude was still unsolved. The final solution, the chronometer, was yet to be invented. Euler then discussed various methods of determining one's latitude using the Moon, or the Moons of Jupiter. But what if there is cloudy weather? So Euler suggests using the magnetic compass itself as a means of determining one's longitude. Euler's theory is quite clever, but of no use to us in this discourse.

Euler referred to a number of experiments on magnetism he had conducted while in Berlin. A magnetic compass does not point to the North Pole. It points, roughly, to the north magnetic pole—but even that is not totally correct. The compass points along a magnetic line of force which at that location might not be pointing directly to the north magnetic pole. The difference between the north geographic pole and the direction in which a compass points is called the declination. It has been found that the declination varies from place to place, from year to year, without any exactly predictable pattern. Scientists have concluded, since the time of Euler, that the general "drift" of the magnetic field is westwards.

Euler points to the work of "Mr. Halley" and tells us that Halley attempted to map the Earth's magnetic field for the year, 1700. Euler mentions that declination is constantly changing all over the world. But what

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causes the Earth's magnetism? Euler tells us about the ideas of scientists of the time who likened the Earth to a gigantic magnet:

> Now if the globe itself were that loadstone (sic), we should comprehend why the magnetic needles everywhere assumed a certain direction. . . **Some of them [naturalists] allege**, **that there is at the center of the Earth a very large loadstone**, **which has exercised its influence on all the magnetic needles**, **and even on all the load-stones**, **which are to be found on the surface of the Earth**. . . But there is no occasion to have recourse to a loadstone concealed in the bowels of the Earth. Its surface is so replenished with mines of iron and loadstone, that their united force may well supply the want of this huge magnet. In fact, all loadstones are extracted from mines—an infallible proof that these substances are found in great abundance in the bowels of the Earth. . .[1]

Euler goes on to suggest that the reason the Earth's magnetic field is constantly undergoing change is because of mining activities! He suggests that as new mines are created, and as iron is removed and moved from others, that this is what causes the motion of the Earth's magnetic field! In principle his idea may be valid, but the extremely small amounts of iron and lodestone involved must surely make this suggestion unworkable. But then again, is it all that much worse than many of the other suggestions of that time? What is more realistic are Euler's reasons for supposing that the Earth's magnetic field is generated in the crust itself. Euler suggests more scientific observations for "several ages" to shed further light on the matter. Returning to the idea of the "Great Loadstone" at the center of the Earth, Euler writes:

> **Those who allege that the Earth contains in its womb a prodigious load-stone**, **like a stone with a kernel in fruit**, **are under the necessity of admitting**, **in order to explain the magnetic declination**, **that this stone is successively shifting its situation. It must in that case be detached from the Earth in all its parts; and as its motion would undoubtedly follow a certain law**, **we might flatter ourselves with the hope of one day discovering it**. . . Certain naturalists have enclosed a very powerful magnet in a globe, and having placed a magnetic needle on its surface, observed phenomenon similar to those which take place on the globe of the Earth by placing the magnet within the globe in

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several different positions.[2]

Euler makes the interesting point that if the Earth's magnetic field were indeed produced by a gigantic magnet at the core, then that magnet would somehow have to be detached from the Earth and be able to rotate by itself to account for the motion of the magnetic field. Clearly Halley and Euler were at odds on this point. Halley sought some moving object inside the Earth, while Euler thought there was no need for such elaborate ideas. Perhaps both of them are right? Such a rotating core as he suggested, sounds very similar in concept to that dense core Dr. Gordeev spoke of when he considered the effects of rotation. The idea is not quite as farfetched as you might think. In a later chapter you will read how some American scientists in the 1990s thought that they had seismic evidence for a solid rotating inner core inside the Earth. They believed they could prove that the inner core was rotating at a different speed to the rest of the Earth. It is strange how some ideas come up time and again, but for differing reasons.

Euler noted that the Earth's magnetic poles do not coincide with the geographic poles. He then made another important point: if one drew a line through the Earth from the north magnetic pole to the south magnetic pole, this line would not pass through the center of the Earth. Euler writes:

> It remains, therefore, that we consider the cases in which these two magnetic poles are not directly opposite, and in which the magnetic axis does not pass through the center of the Earth; for if we embrace the hypothesis of the magnetic nucleus within the Earth, why should one of its poles be precisely opposite the other? This nucleus may very probably be not exactly in the very center of the Earth, but a considerable distance from it.

Euler then mentions that Halley had foreseen this problem too. Euler explains Halley's thoughts:

> Halley clearly saw this difficulty, and therefore thought himself obliged to suppose a double loadstone in the bowels of the Earth, the one fixed, the other moveable; of consequence, he was obliged to admit four poles of the Earth, two of them towards the north and two towards the south, at unequal distances.

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Euler concludes:

> There is no occasion, therefore, for a double loadstone within the Earth, or for four magnetic poles, in order to explain the declination of magnetic needles, as Halley supposed; but for a simple magnet, or two magnetic poles, provided its just place is assigned to each.[3]

Euler's writings help to throw some light on the thinking processes of the scientists of the time, and above all on Halley's early thoughts on magnetism. As has been shown, Halley came to believe, according to the simplistic understanding of magnetism in those days, that there was a "moving object" of some kind inside the Earth. Even if his concentric spheres idea never received acknowledgement from scientists, it is still apparent that he believed there was a "moving part" down there inside the Earth.

But perhaps both Halley and Euler are partly right. Perhaps Euler is right in saying that a great deal of the Earth's magnetism is indeed fixed, and produced by metals within its crust. Then, over and above this, is another magnetic field, produced by something at the core of the Earth. As we shall see, complex computer analysis of this magnetic field shows that it is indeed rotating!

JUSTIFYING THE DYNAMO

Sir Edmund Halley can be excused for developing his sphere within a sphere Hollow Earth model. Scientists of his day did not know that dynamic processes could produce magnetic fields. They therefore thought in terms of solid-state magnets. He thought in terms of permanently magnetized shells or a moving object within the Earth. These shells rotating within each other at very slightly different speeds might then account for the apparent movement of the magnetic field.

Halley has been slated time and again for his strange theory, but I think this is the wrong approach to take. He was a great scientist who had many firsts to his name. His idea was the result of creative thinking, and I see nothing wrong with that. He was attempting to find a solution to a problem, and he was open to new thoughts.

Scientists rejected his ideas. Much later they began to think in terms of a "dynamo." This is what they named the mysterious process which they believed generated the Earth's magnetic field. They have now studied the

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dynamo for a very long time and they know a considerable amount about it. No one has ever seen, or can see, what the dynamo really is. So we have to deduce its nature from its behavior and its effects.

The solid Earth model, as derived from Newtonian gravity led scientists to discover an excessive mass within the Earth which they needed to account for. Since they knew the density of the outer surface was a mere 2.7 g/cm^3, they found themselves with considerable excess mass. So they hypothesized the existence of several "shells" of matter of ever increasing density, until they got to the center of the Earth. Thus they could assign massive values to the density of the matter deeper inside the Earth. In part what they did was logical. One can expect ever increasing density because of the packing effect, and the transmission of stress from here on the surface down into the core.

But remember this: Not one gram of matter has ever been extracted from below the Earth's crust. Not one gram of evidence exists that tells us that the makeup of the Inner Earth is any different to what we know. Everything we have ever extracted from the deepest mines and holes ever drilled was in accordance with matter which we are familiar with. Not one gram of the so-called "olivine" from the mantle has ever been extracted.

In order to explain the strength of gravity on the surface of the Earth, these scientists ended up with a nickel/iron core at the center of the Earth. This core has a tremendous density. Then seismologists discovered that S waves don't pass through the Earth's core. From this they deduced that the "Outer core" had to be non-solid. But, they still needed the necessary mass. So they settled on a "liquid" core, of tremendous density. They justified the liquid nature of this core by appealing to the supposed heat which emanates from the ever cooling Earth below. So now they had a hot, liquid core.

Then other seismologists at the turn of the century discovered some strange behavior from certain seismic waves. They then inferred that these waves were passing through the liquid core and then through another tiny solid core which lay right at the center of the Earth. That has remained the basic conceptual model of the Earth as it stands today.

Scientists are absolutely convinced of this. As far as they are concerned they have solved the problem. All that remains is to "fine tune" the model. They need to fill in the tiny unknowns. They are fine tuning this model today like the Greeks were fine-tuning their astronomical model with the Earth at its center. As far as they are concerned they are on the right track. A few minor fixes to the paradigm and all will be well. This model can never

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change. It represents reality and the truth.

Since before Halley, it has been know that there is something at the center of the Earth which is creating the magnetic field. Halley demonstrated that it was dynamic and that it gradually moved. How do scientists explain this? Looking into the Inner Earth they found that they could not appeal to magnetized ores deep inside the Earth. Since the temperatures and pressures are so great down there, they realized that their iron core would lose its magnetism. The heat was way beyond the curie point of the metal—the point at which it loses its magnetism. So they needed to find something else.

The tiny solid core was of no use to them, even though it lies at the center of the Earth—the very point from whence the magnetic field seems to be originating. So they settled for a much larger thing—the Outer Core. This liquid Outer Core could come in useful. Since it was liquid, what if it moved?

In science classes at school we have all seen convection currents being demonstrated. Hot air or water rises, is cooled, and then sinks. So they then invoked convection currents. Perhaps if the core was electrically conducting, perhaps these movements could generate a magnetic field?

In recent years some of these scientists have even come out to state that this molten iron, under tremendous pressures and temperatures might even have the consistency of water! So it flows and behaves like water —lying there with thousands of miles of rock pressing down on it from above.

Most scientists will consistently admit that they do not know what the exact nature of the dynamo is. This is admitted openly, time and again. But at the same time, if one dares to question its nature then they will tell you that this convection current model is the only thing which makes sense.

And that is quite true. In their “solid planet” model, the convection current idea is the thing which comes the closest to explaining the dynamo. But it falls short on many issues—some of them very serious. But as with so much else in our science—the outlook is so utterly blinkered that scientists end up supporting it simply because their models allow so little else. They’re stuck with a square peg which must fit into a round hole. So they chip off as much around the edges as they can to make it as round as possible. It’s not a good fit but it’s better than they started with. For example, the scientist Masahisa Sugiura writes:

> A survey of the geomagnetic field, which is irregular. . . reveals that its distribution over the Earth can be approximately represented by the field

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> of a bar magnet placed at the Earth's center. **Such a magnet gives the best (but far from perfect) fit to the actual field**. . ." [4]

Scientists are well aware that the convection current model has problems. But it does not cause them to go out and consider other less conventional ideas. Instead they're saddled with this idea and they make the best of it.

When I originally reviewed all the old Hollow Earth literature and theories I noted that something of an "Eulerian" model of the Hollow Earth seemed to have found favor by the turn of the century. Halley had presumed that the Inner atmosphere of his concentric spheres might be luminous. Euler settled for a molten core which provided light and heat. Sir John Leslie liked the idea of two binary Suns. William Reed, an American at the turn of the century settled for a gigantic volcano somewhere inside the Hollow Earth which was spewing out dust and providing a dull red light. Marshall Gardner, settled for a combination of what Euler and Leslie had proposed: A single Inner Star inside a single hollow shell.

Gardner went and explained that this star's light might be producing the aurora. He tried to demonstrate that the aurora is not only magnetic in nature, but that it has the ability to operate independently of geomagnetism. Gardner made quite a reasonable attempt at the matter, considering that he wasn't a scientist. But Gardner could not explain how such a star might operate. Nuclear fission and fusion had not yet become fact. Gardner could not explain how such a Sun might survive for long periods without burning out. He could never have imagined that his theoretical star might actually create the Earth's magnetic field. There was much which Gardner did not know then. And yet when I began to think about his ideas, I could easily see room for adding to its finer details.

When I first began to think in terms of Hollow Planets I wanted to test this idea of a single Sun at the center of the Earth. One of the earliest thoughts which crossed my mind resulted from a connection of several things. Nuclear explosions produce a local aurora. Nuclear explosions also produce tremendously powerful magnetic effects. Nuclear power is what drives the Sun. Nuclear processes produce a considerable amount of energy from a small amount of matter. Nuclear processes can produce energy for millions or even billions of years—as long as there is fuel.

I was quite taken with this simple idea. It seemed to have some real possibilities. I had no idea whether the physics would make any sense. But I

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allowed for the fact that there is much in nature which we do not know. I wanted to test the conceptual idea of a nuclear star at the center of a Hollow Planet. Neither Euler, nor Leslie, nor Gardner could ever have known about the advent of nuclear power. I thus had a theoretical advantage over them.

Since I knew a little bit about astronomy I had realized from the beginning that hydrogen fusion just wasn't practical for a small Sun sitting inside a planet. But there seemed to be a reasonable alternative: nuclear fission. It still has problems, but it has some interesting potential as an idea if we allow for the fact that there may be much more to learn about nuclear processes. This idea is very new, and no scientist has ever considered it.

Perhaps some experiments can be designed to test the idea? Even in my own country we have nuclear reactors operating using fission processes. Fission drives nuclear submarines; most nuclear reactors; aircraft carriers and so forth. Fission is a small, workable, energy source. It can power a nuclear submarine for years at a stretch.

So when I studied issues relating to the mysterious dynamo, I wanted to see how the dynamo behaved. Did it behave like a liquid with slow convection currents or did it behave like a star? We know a lot more about stars and the fusion process. Perhaps we can infer a few facts from this, and make allowances for a fission process operating inside a planet?

This idea of course changes the entire nature of planets. It was always assumed that planets cool down and die. But what if planets are themselves sources of energy and heat? What if life were to evolve inside planets? Such life might be independent of the star around which the planet orbits. Perhaps the life span of such planets is much longer? Can planets survive even if their outer Sun is destroyed? I wondered if planets could be like the seeds of a flower? Can planets fly across the galaxy while providing their own energy for life inside them? It is an intriguing idea.

If planets do not cool down that alone might affect the processes around which we have based some of our ideas about evolution. This concept is totally new and it opens up all kinds of theoretical possibilities which have never before been conceived or dreamt of.

In this chapter we will examine the dynamo. We will discuss its nature and its behavior. I hope to show you that the dynamo is not conforming properly to solid planet theory. The nature of the beast does not match its observed effects. Something is amiss. I will give you my reasons for doubting the dynamo.

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POLE DEFINITIONS

The Earth spins about its axis every 24 hours. The positions where this axis intersects the Earth's surface are known as the north and south geographical poles. The term "North Pole" therefore is a reference to the North geographical pole.

Imagine a bar magnet at the Earth's center. This bar magnet causes the Earth's magnetic field to fan out in all three dimensions. The North and South Poles of this magnetic field is known as the geomagnetic North and South Poles. This pole is sometimes also referred to as the Geometric Pole. Its current position in the northern hemisphere is 79.12° N 71° 12 W—this being in north western Greenland. The geomagnetic South Pole lies at the Russian Vostok base in Antarctica.

The magnetic field has both vertical and horizontal components. The point where the field points directly downward is the North Magnetic Pole. Here the dip is 90°. The current position is approximately 78° North 103° West—this being in north western Canada. This "pole" moves gradually westward. The behavior of the magnetic pole is very complex. During a normal day it moves in an ellipse. When people refer to the Magnetic North Pole they are normally referring to this pole.

Another lesser known fact is that the vertical component of magnetism actually has two poles in the northern hemisphere. The one above being the one in Canada and the other lying in Siberia in Russia.

I was curious about the determination of the positions of the magnetic poles. So I contacted Larry Newitt, a Canadian scientist who went to the North magnetic pole to determine its position. He was very helpful indeed. He also referred me to C. Barton, an Australian scientist who determined the position of the south magnetic pole. It was interesting reading their papers about the Earth's geomagnetic field.

THE MAGNETIZED EARTH

Here is but one of many examples of scientists admitting that the dynamo itself is a mystery:

> **While no one knows for certain just why the Earth has a magnetic field at all**, the widely accepted view at present is that it is the result of some kind of dynamo action in the Earth's core which is known from

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geophysical arguments to be an electrically conducting fluid.[5]

The first real embarrassment is that the geomagnetic, magnetic and geographical poles should all coincide with each other. They should all be located at the geographical North Pole. But they are not.

It seems to me that the Earth's magnetic field is being deformed by magnetic ores inside it. This is especially apparent in terms of the magnetic poles. These are smaller, localized features. The dual nodes of the vertical component of magnetism (Siberia and Canada) also add to this impression. The greater part of the geomagnetic field is centered on north western Greenland. But these "mini-poles" sitting in Canada and Siberia are somewhat out of place. These seem to be, in part, deformations of the magnetic field.

Two options exist here. Either the magnetic field which is produced inside the Earth is somewhat skewed, or something beneath the Earth's crust is causing this deformation. For our purposes the magnetic poles themselves seem to be of little importance.

The real issue however are the geomagnetic poles which lie in Greenland, with its other end in Vostok. It is this pole which is the embarrassment. If the convection currents inside the liquid core are driven by the Earth's rotation then the net result should be a magnetic field centered upon the geographical pole. But it isn't. There is no planet with a magnetic field centered upon its geographical pole exactly—regardless of how fast it rotates.

Scientists are somewhat limited in appealing to magnetism inherent inside the Earth for the simple reason that they have this image of ever increasing temperature and pressure. This denies them that simple option for accounting for the deformity of the magnetic field.

This is where the gravity effects I proposed in the Hollow Planet idea become so useful. One may not always dealing with increasing temperature and pressure. It may therefore be that ores deep inside the Earth deform the magnetic field and cause the many quirks inherent in it.

On the one hand, the magnetic field seems to be generated by a "dynamo", but it seems to me that it overlays a fixed magnetism within the crust. The one field is dynamic and the other static. This combination seems to be responsible for the strange features of the magnetic field.

Using historical records of the surface geomagnetic field from 1715

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through 1980, J. Bloxham has, with the help of “new mathematical methods”, mapped the geomagnetic field at the surface of the Earth’s core over the past 265 years. As generally expected, the field in the polar regions of the core remained essentially fixed, but so did four lobes of high magnetic flux located symmetrically on either side of the equator at 60° latitude and at longitudes of 120° E and 120° W.

“’That the four lobes have stayed in place for nearly 300 years is surprising,’ says Bloxham. ‘Traditionally, scientists have envisioned the entire field as drifting westward across the face of the planet at about 0.2° per year because the core rotates more slowly than do the mantle and crust. If the four lobes had been drifting at 0.2° per year, they would have moved by over 50° longitude since 1715’”.

Bloxham went on to say that the westward drift cannot be occurring everywhere on the core’s surface. He suggested that something is keeping these lobes stationary.[6]

Bloxham and D. Gubbins ventured that these four lobes, while probably consistent with dynamo models of the geomagnetic field, are anchored in place by the mantle, which convects much more slowly than the core. P. Olsen made the startling observation that the four lobes may be likened to pairs of Sun spots, which are also located symmetrically about the Sun’s equator and are, in addition, magnetic in nature

Since it is a star which we are looking for inside the Earth, this observation of Olsen is indeed interesting. However, after due consideration, I cannot accept it as evidence for a star inside the Earth.

My own suggestion is that these four lobes might be caused by fixed ores inside the Earth. Their longevity is very difficult to explain. They have remained stationary for 300 years. If no movement is apparent in such a long period then it would seem that these lobes are truly geographically fixed. However, much as Bloxham and Gubbins might have liked that possibility, their own solid Earth theory denies them that option (because of high temperatures and pressures). Instead they were forced to opt for further convection currents, this time in the mantle, which are even slower and which may cause the lobes. I wonder how viable this alternative really is, and whether they’re not perhaps clutching at straws?

The non-dipole geomagnetic field (sometimes called the “geomagnetic anomaly”) is what remains after the dipole field has been subtracted out. Some large-scale departures from the dipole field are obvious.[7]

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The tilt of the Earth's magnetic field and those of other planets (especially Uranus, 60°; and Neptune, 47°) seriously challenge the dynamo theory, since this theory relies on the planet's rotation. The way in which scientists deal with the tilt anomaly, as well as other anomalies of the geomagnetic field, is to suppose there are secondary dipole fields created at "spots" near the surface of the liquid core. S. Akasofu and T. Saito, for example, think that two or three such extra dipoles effectively tilt the magnetic fields of all the planets afflicted by this divergence of axes. In their theory, the axis of the main dipole field remains parallel to the axis of rotation, but the secondary dipoles warp the total field.[8] K. Whaler has objected that there exists no known physical mechanism for creating such secondary dipoles near the liquid core's surface.[9]

It may be possible to conceive of complex circulation patterns in the Earth's liquid core that can account for just about any distortion of the basic dipole field. But then one must explain the complex circulation patterns! It's a messy set of options.

It seems to me that the existence of several fixed "spots" and "lobes" are testimony to fixed magnetism, deep in the Earth where theoretically it should be too hot. Here we therefore find some more corroborating evidence which is in line with deep focus quakes, that deep down, the Earth is brittle, cool and solid. Clearly, gravity doesn't seem to be working as it should.

THE SPINNING CORE

Bloxham and Gubbins stated above that the core rotates more slowly than the rest of the Earth. Even if the liquid core has the consistency of water (which I question), I still can't see how this could possibly occur. A simple example serves to show that such rotational differentials cannot possibly work in practise especially not for billions of years. Take a bucket and fill it with water. The walls of the bucket would be analogous to the crust of the Earth, and the water inside would be the "molten metal core". Now take the bucket of water and begin turning it gently. You will find that after a few turns the water inside the bucket will begin moving. The slight friction between the sides of the bucket and the water will cause the water to begin turning. Eventually all the water in the bucket will turn at the same speed as the bucket. This experiment is a reasonable and valid analogy. This is because gravity will be causing thousands of miles of rock to press extremely

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tightly against the liquid core.

Firstly, you will notice that it does not take very long to get the water in the bucket spinning, a few seconds at the very most, no matter how slowly you turn the bucket. In the case of the Earth we have a planet which has been spinning—not for a few minutes, but for billions of years. Secondly, according to current scientific theory the core would be under great pressure from all sides. Thirdly, I find it hard to believe that the liquid core has the consistency of water. But even if it does I still question the concept. Fourthly, the Earth's inner crust would not be smooth at all. Seismologists already know of these so-called valleys. These things will add to the friction between the solid Earth and its liquid core. All these points serve to show that there would be far more friction at work on the Earth's molten core than on the water in the bucket.

The issue is that of convection currents in the molten core. Here we are told that the Earth's magnetic field is caused by convection currents which occur in the core. We face a number of problems: Firstly, for convection currents to form there needs to be a temperature differential between the different parts of this "liquid". In other words, one part needs to be hotter than another. Thus we should find hotter metal rising and colder metal sinking. It also means that heat from inside the Earth would gradually be lost to the outside. The molten metal would not move as easily as a true liquid. Are convection currents really a feasible idea in such a setting? Would this rising metal not lose its heat long before it has completed its upward movement?

Convection currents are caused by changes in density. The hotter liquid is less dense, and so gravity has less of an effect upon it than the colder liquid. However, in a model of a solid Earth, we know that gravity decreases the deeper you go. Take a look at the table in Chapter 3. Note how weak gravity is below a depth of 4,000 km. Near the center of the Earth the liquid would almost be in a state of total "weightlessness". The molten core is not very large, and much of it is extremely close to the center of the Earth. Would this extremely weak gravity be able to act on this viscous liquid which is under this tremendous pressure? And even if it did, would there be enough motive force under such weak gravity to actually generate anything?

Current scientific thinking is along the following lines: The motion of a conducting fluid across a magnetic field induces an electromotive force which drives an electric current that produces a magnetic field. The problem

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with this is that one needs a primeval magnetic field to begin with. You need a magnetic field in place before this type of dynamo could even start up. But how could there have been one under the type of temperatures and pressures which scientists expect in the Newtonian scenario? Because of the similarity of this concept to the behavior of a self-exciting dynamo this mechanism was dubbed the “dynamo mechanism.”

So first you need a magnetic field, then you need to move a conducting fluid (molten metal) across that magnetic field and hey presto you get another magnetic field! Where did the original magnetic field come from in the early hot, molten Earth? I can see no possible justification for supposing that there could ever have been a primeval magnetic field.

But can a moving liquid generate a magnetic field? Yes, but only in nuclear physics. The “liquid” (and it’s not a liquid in the normal sense of the word) in such an instance is called Plasma. This brings us back to the idea that the Inner Sun is a nuclear furnace which runs on nuclear fission or some other type of nuclear-based reaction.

Recently scientists announced that they had discovered that the Earth’s solid core rotated. This evidence would tend to suggest that the Earth is solid, for how could they determine the rotation of something which doesn’t exist? You’d be surprised.

In an article I have from the *Los Angeles Times* of 18 July 1996, it states that scientists determined the rotation by tracking the times of seismic waves between 1967 to 1995. From this they determined that the core was rotating. Sounds pretty impressive doesn’t it? They analyzed data covering a period of 28 years. Their conclusions must surely be indisputable? This particular incident is worth examining to see how scientists arrive at their conclusions and how impressive it seems.

Gary Glatzmaier of the Los Alamos National Laboratory in New Mexico and Paul Roberts of the University of California, Los Angeles developed a sophisticated computer model of the Earth’s magnetic field. Their model assumed that the magnetic field was created by convection currents in the outer core. According to them:

> The model suggested that the inner core rotates eastwards at about one to two degrees a year faster than the rest of the planet.

Two other scientists, Richards and Song, then decided to try to confirm

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this concept of the rotating core. Since 1967, 38 earthquakes of magnitude 5.5 or greater have struck the South Sandwich Islands near Antarctica. They studied seismic waves which had travelled from these islands through the Earth's core, to Alaska. Some of these seismic waves were thought to have passed through the inner core on their way to Alaska while others had passed through the outer core. They found that in 1967 seismic waves which had passed through the outer core were arriving 8 sec later than those which had passed through the inner core. By 1995, this time difference had increased by 0.33 sec. The waves were thus travelling faster through the inner core.

Richards and Song are convinced that there is a seismic "fast track" in the solid inner core. This "fast track" is aligned on a north-south axis. They believe this alignment is due to the orientation of hexagonal iron crystals which are formed under great pressures in the inner core. Richards and Song believe that the seismic "fast track" is a physical feature of the inner core. Hence, if the "fast track" has moved then the inner core must also have moved by the same amount.

They believe that the seismic waves are now moving more quickly because this "fast track" is more closely aligned to the path of the waves they analyzed. From this, they conclude that the inner core must have rotated through 90°, relative to the Earth's surface, since 1900. They also found that seismic waves from New Zealand to Norway had slowed, as if the "fast track" had moved away from that particular path. This confirmed their belief that the inner core was rotating eastwards. Other scientists at Harvard University using a similar techniques confirmed their results. How do the scientists explain the rotation of the inner core under such pressures? They state that:

> Electric currents of about a billion amps flow across the boundary between the solid inner core and the fluid outer core that lies around it.

They believe that because of the Earth's magnetic field, these electric currents generate very powerful forces which tug at the inner core. Since the outer core has a low viscosity, the inner core can then spin quite freely.[10]

Here we have two separate issues. On the one hand scientists have been "mapping" the Earth's magnetic field back to the core. By doing this through a computer simulation they have discovered that the "core" rotates more slowly than the Earth. In an article in the *Los Angeles Times* concerning this

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discovery it mentioned a few other things. UC Berkley geophysicist Raymond Jeanloz stated:

> . . . the liquid part of the core has the consistency of water—even though it is made almost exclusively of iron.

It is interesting that the inner core, composed of molten iron is supposed to have the viscosity of water such that the solid core can spin freely inside. How's that for having it both ways?!

Yet not long ago these same scientists didn't think these same thoughts. In that same *Los Angeles Times* article it states:

> Song said he was 'truly surprised' by the finding because it **contradicts the conventional geophysical mind-set about the inner dynamics of the planet. 'We have tended to see the internal structure of the Earth as static,' he said. Now it's clear that the inner Earth moves with astonishing swiftness."** (*Los Angeles Times*, 18 July 1996)

On the one hand we have a computer model based on the Earth's magnetic field which shows that whatever is causing the magnetic field is rotating. That is extremely important.

Then there is the issue of the "fast track" along which the seismic waves travelled. These scientists believe they have proven that the solid core rotates and that they have measured this. Because this confirms the computer prediction they feel that this is now correct. But it's not nearly as neat as that.

What is this "fast track" anyway? The "fast track" is a recently discovered fact that some seismic waves travel much faster when moving in a north-south direction than when they move in an east-west direction. This is after they have taken into account the Earth's wider equatorial girth. Why this is so nobody knows. So Richard and Song have taken some north-south seismic readings and determined that on the line: Sandwich Islands to Alaska the seismic waves have speeded up, while on the New Zealand–Norway line the seismic waves have slowed down. These scientists now argue that the "fast track" has moved and therefore this indicates that the solid core is actually rotating. . . From this they estimate the core to have moved 90° since 1900.

Let me now introduce the Reader to the original discovery of this "fast track". An article in *Science* in 1988 analyzed the problem. When it was first

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discovered that east-west seismic waves were slower than north-south seismic waves, some scientists from Harvard University suggested that the speed of the seismic waves might be dependant upon the direction of the waves through the inner core. They thought that the crystals in the Earth's inner core were aligned in a north-south direction thereby facilitating faster travel in that direction. It is clear that Richards and Song believed in this theory. This is the basis upon which they set out to prove that the inner core is rotating.

But what were other scientists saying back in 1988? They were criticizing the Harvard suggestion. The director of the seismological laboratory at the California Institute of Technology (Caltech), was Donald Anderson. He commented: **"**All of the possible explanations of this phenomenon are outrageous."

Anderson's team of scientists studied the problem and determined that the Harvard explanation was "insufficient." Anderson concluded that the "least outrageous" explanation is that the outer core is not a pure liquid. He ventured that perhaps it was a slurry which contained iron filings. He expected the seismic waves to speed up when they struck greater concentrations of dense material.

Robert Clayton and Olafur Gudmundsson, also of Caltech, discovered that the speed problems were not limited to the inner core only. They found that the seismic waves also travelled at different speeds when moving through the outer core! Anderson referred to this discovery as a "complete surprise." This is clearly impossible since a liquid is isotropic and maintains an equal pressure throughout. The speed of shock waves throughout a liquid or semi-liquid should therefore be consistent.

Anderson had wondered if currents inside the outer core might help to speed up the seismic waves. But, he concluded these currents would have to move at such high speeds as to defy all theory.

Anderson suggested that maybe perhaps a "super magnetic field" which would slow down east–west seismic waves. He commented upon it as follows: "It's an attractive hypothesis, but theoretically seems implausible." The problem, Anderson noted, is that the magnetic field would have to be as strong as the magnetic fields of some stars![11]

There are several contradictions to be considered. The outer core, which should be a liquid or semi-liquid, and therefore isotropic, exhibits the characteristics of a solid. The behavior of both the inner and outer cores is

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highly suggestive of solid matter. As discussed earlier, these seismic waves must be passing through a solid shell at all times, hence these anomalous results are understandable.

The various scientists mentioned seemed to be grasping at various straws to try to explain these totally unexpected results. Donald Anderson felt that these results could be explained if there was a super magnetic field inside the Earth, just like one finds in some stars! This “of course” is theoretically impossible. Perhaps of course Mr Anderson’s suggestion would not be so silly if there really was a star inside the Earth!? And maybe such a star would indeed be the partial, or perhaps even the complete explanation for these anomalous seismic results?

Anderson’s statements are reminiscent of the Apollo 12 seismic experiment results. What seems to happen is that the “outrageous” results are soon rationalized away, soon incorporated into the current model in some way—and then forgotten. It seemed quite conclusive that the Harvard suggestion was flawed to begin with, but then everybody forgot that and later came back and expanded upon it!

Even those scientists who added to it were surprised by the thought that the core was rotating because it was supposed to be stationary. Herein lies a mystery. What is the “fast track?” The fast track supposedly runs through the solid inner core. It can’t exist in the mantle, or outside the liquid core because then it couldn’t move. These scientists believe that it lies in the Inner Core itself, and that it has therefore moved. But they have no idea what the “fast track” really is or what could cause it.

Another possibility is that the “fast track” is a strain event in the Earth’s crust. The fast track might be an area undergoing compression due to various forces in the Earth. Thus seismic waves travelling through this region might be speeded up. Then at a later date, this strain might move to another part of the crust, speeding up waves in that region. The fast track is no guarantee whatsoever that they have truly mapped a feature of the Inner Core.

Logically, all these scientists really know is this: Previously seismic waves from the Sandwich Islands to Alaska travelled more slowly, now they travel faster. They do not know where these waves are travelling exactly and they cannot prove that these waves are travelling through the “fast track”. They’re treating the “fast track” as if it were a physical feature. But they do not know whether this is so. It could be a spin-off of the Chandler wobble for example. There may be stresses which have moved to another part of the

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Earth, thereby changing the speed at which the seismic waves are moving. The Earth is not perfectly symmetrical. It is dynamic and in a state of flux and imbalance. As it is spinning, various forces are acting to redistribute the mass of the Earth. Strains will move.

These results showing that seismic wave speeds deep through the Earth have changed, do not in any way prove that the core rotates. That takes quite a leap of faith. Logically, the connection here is extremely weak. These scientists are drawing more conclusions than they have logical claim to from merely this one piece of evidence. This in no way proves that a solid core is rotating at all. But they are so married to the idea of a solid core that from their viewpoint this is logical.

Prof. Ken Creager, an associate professor of Geophysics at the University of Washington wrote a paper rebutting the Lamont–Doherty research regarding the fast-spinning core. He questioned the idea of the Earth's core rotating through 90° this century. His own research caused him to revise the spinning of the core idea and to state that it took 1,000 years for the core to do one complete revolution. In a news release, on 13 Nov 1997, for *Science*, which he sent me a copy of, he stated his conclusions. What Ken Creager discovered was that the seismic waves slow down considerably in a short stretch of 300 mi. Creager concluded that the core therefore did not have to rotate as far as was previously supposed. Again we see that seismic waves can speed up and slow down for apparently no reason. This time the results were totally different.

So Creager obtained results which were much slower than the previous results. But how trustworthy are any of these results? For example, how can we be sure that there aren't other factors at work also affecting the speed of seismic waves? In this example he discovered that seismic waves could be slowed down considerably over a short distance. I seriously doubt that there is any evidence whatsoever for any type of rotating solid core.

In an earlier chapter we met with Dr. Frohlich and his thoughts regarding deep focus quakes. Dr. Frohlich is a seismologist and I tried to engage him in various discussions but he did not seem very interested. He did correct a misunderstanding of mine about matter deep inside the Earth:

> I don't know [Prof.] Goldsmith, but do believe that you have misinterpreted what he said. A material under stress will deform, either slowly by creep and flow, or suddenly by rupture (an earthquake). But,

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> the strength of a material (its ability to resist rupture) depends both on temperature and pressure as well as the rate at which the material is stressed (i.e., the strain rate). **Thus**, **a hole or crack will ultimately close up at depth**, **but if it is stressed-strained fast enough it can rupture.** No stress results in healing of cracks, but lots of stress results in crack propagation.

I replied as follows: "Well the idea that the molten matter down there is 'water-like' comes from an article I'd read about Raymond Jeanloz. There was an article where some scientists proposed that the Earth's inner core was spinning rapidly. They reckoned it was possible because the molten outer core 'had the consistency of water' to use their words—so they figured it could spin quite freely. I think they proposed that the whole core could rotate within a century or so. Later I noted someone else saying they had it all wrong and it spun but much slower."

Dr. Frohlich seemed to tire of me after these short discussions, and he never replied to that or any of my other e-mail. Perhaps we just got off on the wrong footing. It's a shame because I greatly admired his papers regarding deep focus quakes and he told me they were very popular.

Let me add a final thought regarding the spinning core. Prof. Gordeev, who is a mathematician told me that he's not convinced of these explanations either, but for different reasons. Prof. Gordeev is a great admirer of Euler. In an e-mail dated 20 June 1998 he wrote:

> . . . Euler probably was the 'perfect mathematician' of his time, **i.e. He only cared about the mechanical plausibility of scientific theories. I also tend to argue along these lines**. . .

With regard to the spinning core, he commented as follows:

> Well, they now claim that there is a difference in the speed of rotation between that 'solid' core and its 'semi/quasi/not-exactly liquid' environment. **This means**, **the system is unstable**, **the viscosity is taking energy away. Therefore**, **it's absolutely mysterious that the whole rotation did not stop millions of years ago.** Look, quite recently NASA came out with yet another revelation: that all of a sudden days are getting longer (i.e. the Earth is rotating slower) due solely to that El Nino. But I don't need calculus in order to claim that all those

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> atmospheric plus oceanic streams' alleged irregularities are incomparably less dramatic for stability of Earth' rotation, since their mass is incomparably smaller. And yet scientists cry wolf!

Thus, according to Prof. Gordeev, the spinning core theory is mechanically implausible and the Earth would have stopped spinning a long time ago. If something as innocuous as the El Nino can change the Earth's rate of spin measurably then the effects of heavy masses of molten lava inside the Earth would have had a much more noticeable effect.

Prof. Gordeev's logic does not apply to a small star, which is floating in an inner atmosphere, devoid of physical contact with the solid Earth. It would not rob the Earth of its rotational energy.

Gary Glatzmaier's computer model of the Earth's magnetic field is a different matter altogether. The Earth's magnetic field emanates from inside the center of the Earth, whatever may be there—solid core or Inner Sun. The magnetism pervades the outside of the Earth and can be measured from space. We can obtain an accurate picture of this magnetic field's behavior and its small scale changes. The idea of thus mapping back-wards to see what this field might be like at the "core" is quite valid. Of course this will be affected by what scientists believe the Earth's inner structure to be like. Even if the final result is not perfectly accurate, it nevertheless will give us some indication of the magnetic lines of force emanating from inside the Earth.

This concept seems quite sound to me, and therefore the results can be trusted—quite unlike the very scant data on which the physical rotating core idea is based. What these scientists modeled and discovered—to their amazement was that whatever it is that is creating the Earth's magnetic field is itself rotating!

The idea of a solid core rotating at a speed different to that of the planet just doesn't make sense. These scientists say this core weighs about as much as the Moon—roughly about 1/81th the mass of the Earth. That translates into a mass just a little more than 1% of that of the rest of the Earth. Now this 1% mass sitting at the center of the Earth is under extreme pressure. We're talking of some 4,000 mi of solid rock and semi-solid material above it—most of which has a density of 5.5 gm/cm^3 or more. The pressure on the core must be tremendous—tons upon tons of pressure per cm^2. I find it hard to believe that there can be a freely rotating solid body under those pressures—even if it is surrounded by a liquid with the viscosity of water. Neither the

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mantle, nor the inner core can be perfectly smooth. I'm also not sure I can believe that the molten iron of the outer core has a consistency of water. There must be tremendous friction.

What has been discovered is that whatever it is which is causing the Earth's magnetic field is itself rotating. An Inner Sun floating in an atmosphere or a semi-vacuum (of its own making) could easily spin relatively freely. It would not have even a fraction of the friction which would act on a solid core. These magnetic simulations are proof indeed that something at the center of the Earth is spinning independently of the solid crust of the planet.

In that *New Scientist* article, the computer model showed that in order for the Earth's magnetic field to be produced that "electric currents of about a billion amps flow" inside the Earth. I also think the idea of convection currents in the liquid core being able to produce a current of about a billion amps is pretty farfetched. Can weak convection currents in molten iron actually do this? Wouldn't a nuclear reactor be a better bet if you wanted a billion amps to produce a magnetic field around a planet 7,926 mi in diameter?

What if these scientists have really discovered an Inner Sun, generating a billion amps of electrical current and spinning at a rate different to that of the Earth?

DYNAMO DOUBTS

Understanding the Earth's magnetic field has been much more difficult than its detection. The geomagnetic field is rather weak when compared to the magnets we manufacture. The total magnetic intensity at the equator is about 0.3 gauss. At the polar regions it is about 0.7 gauss. The geomagnetic field can be approximated by a dipole, located at the Earth's center, tilted about 11° to the axis of rotation. This tilting of the magnetic axis remains an anomaly. The main dipole, as predicted by a magnet at the Earth's center accounts for about 90% of the geomagnetic field and provides geophysicists with the familiar diagram showing magnetic lines of force exiting one polar region and entering the other. This neat portrait of the geomagnetic field is marred by several important anomalies that cast doubt upon it.

1. The axis of the steady-state geomagnetic field does not lie parallel to the axis of rotation.

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2. There exists a significant (10%) non-dipole field.
3. The non-dipole field has a complex structure and undergoes unpredictable changes. One of the greatest problems in geophysics is the development of a theory that will account for the steady-state anomalies and the so-called secular changes.

The following factors place limitations on the theories which scientists may entertain:

1. The temperature of the Earth rises rapidly as one drills down through the crust. By extrapolating these measurements, it can be asserted that at depths of just 100 km or so, temperatures have surpassed the Curie point of known materials, and it is too hot for magnetism to exist.
2. Secular changes of the geomagnetic field occur too rapidly to be accounted for by solid, permanently magnetized materials.
3. The electrical resistance of core materials, as predicted from present models of the Earth's interior, is too high for the Earth's field to be generated by deep, still-circulating, primordial electrical currents, assuming that the Earth is billions of years old.

Hence the dynamo theory becomes the only viable alternative. In most modern scientific books and papers, it is stated dogmatically that the dynamo theory is the only viable theory. This is an extreme statement in the light of the difficulties the geodynamo theory encounters.

H. Takeuchi once stated that many hypotheses have been offered and rejected. He felt that the fairest answer would be that the geomagnetic field is caused by electric currents within the core, and that these currents are probably induced and maintained by a mechanism such as a self-exciting dynamo. He said that the dynamo theory was certainly by far the best yet offered. He concluded: "It is not perfect, but it surpasses all others by a wide margin."[12]

Time and again scientists admit the deficiencies of the dynamo theory. But there is no reasonable alternative within their solid-Earth paradigm. So maybe their paradigm needs reviewing? In 1988 McFadden and Merrill wrote:

Although there does seem to be a strong consensus that 'the dynamo

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> model picture' for the Earth's magnetic field is correct, there are in fact many dynamo models, **none of which has been demonstrated to work for the Earth**, **and each of which is incomplete in some manner or another. The problem is very difficult because**, **for even an approximate solution**, **there are several coupled nonlinear partial differential equations that must be solved simultaneously. Furthermore several of the critical parameters are effectively unknown (e. g.**, **the viscosity of the Earth's core is still not known within several orders of magnitude)**. Overall, we appear to be far from obtaining a complete solution.[13]

Note how many unknowns remain. The problems afflicting the geodynamo theory are several. Doubts exist as to just how the "simple", "basic" dipole field is generated. The situation worsens when the subtleties of the non-dipole field are considered. There are two additional problem areas:

1. The source of the initial magnetic field required to start up a self-excited dynamo.
2. The source of the energy that keeps the geodynamo going once started.

In 1967, H. Takeuchi stated that a self-excited dynamo requires a separately supplied magnetic field to get it started. The separate field need not be large—just enough to prime the pump so to speak. He suggested possible sources of this field: 1. Thermoelectric currents in the mantle. 2. The solar magnetic field, which extends throughout the solar system.[14]

Are these ideas truly workable or just the clutching of straws? It would seem to be the latter because now, thirty years later, the problem still remains unsolved. Maybe it just cannot be solved by the current paradigm for the simple reason that the geodynamo is something totally different in concept. Perhaps you can only go so far attempting to fit a square peg into a round hole.

According to G. Brent Dalrymple writing in 1983, the geodynamo would require a staggering $8x10^9$ watts of power to keep it operating at its present level.[15] This power required to sustain the geomagnetic field eventually manifests itself as heat in the liquid, electrically conducting core. Opinions differ as to the source of this power. Initially, in the geodynamo theory, this power is expressed in the motion of the core fluid (convection,

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turbulence, etc.). Several ways have been suggested for setting the core fluid into motion:

1. Heat from disintegrating radio-active materials. According to H. Takeuchi, the meteoric iron, which we would expect to be similar in composition to the Earth's liquid core, does not contain enough radioactivity to run the geodynamo.[16]
2. Relict heat from the Earth's formation. G. B. Dalrymple states that, over the past 3 billion years, a temperature drop of only 100°C in the core would have been sufficient to keep the geodynamo going.
3. In 1990, W. V. R. Malkus suggested that the Earth's rotation, as manifested in precessional motion and convection in the core could do this.[17]
4. In 1973 it was suggested that seismic energy was communicated to the core.[18]
5. J. A. Jacobs suggested that gravitational energy is supplied through chemical differentiation as heavier materials sink and lighter ones rise.[19]
6. H. Takeuchi also suggested heat evolving from liquid-to-solid phase changes.[20]
7. In 1988 Mike Fuller suggested that the impact energy from asteroids, comets, etc might transmit energy to the core. Obviously, immense impacts would be required to transmit sufficient energy to the deep core.[21]

The general consensus among scientists seems to be that most of the geodynamo's power is derived from heat (both relict and radioactive) and the Earth's rotation. However, all of the listed possibilities, except #7, may be involved.

H. Takeuchi did also mention another possible source as thermoelectricity generated by unidentified thermoelectric couples in the Earth.

Let us pause here for a moment and consider all this. Why do scientists keep on suggesting all manner of new sources of energy for the geodynamo? The reason simply is that all the models are flawed. Scientists themselves realize this. Here we have trained geophysicists spending decades using the latest computer analysis and mathematical techniques. And they keep on

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finding that the models just don't work. So they try different ideas. I can't help smiling at suggestion #7 above. It demonstrates the utter desperation of these people in trying to find a workable model.

Note that radioactive decay was mentioned in point #1. But then again the metal core is not a valid source of radioactive elements. But what if there is no metal core to begin with?

I have known Dr. L. Gordeev for a number of years. He is an open-minded mathematician and logician. Dr. Gordeev told me once that he was not convinced by the concept of a metal core. Why a metal core? I told him that the idea of the metal was derived probably from Newton, meteorites and seismic studies. There is no great indication that the core should actually be iron or nickel/iron per se. Dr. Gordeev posed the question: Why can't the core be something very dense like gold? i.e. If the solid Earth condensed and solidified, and heavy materials sank to the center, why doesn't the core consist of gold, lead or some other extremely heavy metal? Wouldn't that be more logical?

But why not something heavier? What of radium or uranium? These are supposed to be trace materials from some kind of exploded star in the vicinity where the solar system formed—so they say. But what if they are wrong and radioactive materials can form somehow—by some natural, unknown process?

I have read time and again where scientists state that no one knows what will happen to matter at the incredible pressures which exist inside the Earth. I know this defies the laws of chemistry, but what if those pressures could change matter or cause it to function differently? Could a lead core turn into uranium? I know it's a very stupid suggestion but I'm asking anyway. Could some kind of self-enriching process actually start up in a dense core under tremendous pressure? Or does some other process begin? Is there some kind of antithesis to gravity which kicks in when gravity becomes too great?

Is the Earth really that complex inside—if it were solid? Haven't these gentlemen covered all the possibilities and found them wanting?

I once came across a gentleman on Internet with some scientific background. His pet theory which he kept throwing at geologists (to their extreme irritation!) was that perhaps matter is being created in the Earth's core. I have even heard suggestions (from some off-beat scientists) that miniature Black Holes might exist in the center of the Earth. Of course the first question I would ask is why such a little Black Hole hasn't had the Earth

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for its lunch? Surely it would swallow the entire Earth?

I thought the idea of matter being created at the center of the Earth was indeed an ingenious suggestion. I can't say I agree or even fully understand that man's suggestions, but perhaps the idea has merit. Could it be that all planets initially condense, become solid and then under those tremendous pressures some process takes place in the core which causes an Inner Sun to then hollow out those worlds?

In fringe areas the hot, molten core is beginning to give way to more exotic theories. Perhaps in time scientists will begin latching on to some of these ideas? Once hollowed out, does a nuclear Sun then float about inside those worlds?

THE CHANGING GEOMAGNETIC FIELD

If the geomagnetic field is caused by the Earth's rotation then one would not expect it to change much. Current measurements of the magnetic moment of the geomagnetic field since 1835 show a steady decrease of about 0.05% per year. This amounts to 5% per century and is a large change. If this rate of decay persists, the Earth's magnetic field will vanish in only 2,000 years or so. This trend raises important scientific and practical questions.

Will this decay of the field continue? Of course, no one can predict the future with certainty. Perhaps the trend may reverse. Or the geomagnetic field may become null and then reverse polarity; or the field may even disappear permanently. In this situation, an appeal to archeomagnetic measurements involving dated pottery assures us that the geomagnetic field has had its ups and downs over the last several thousand years. In other words, these decreases have happened before.[22]

Paleomagnetic research tells us that a geomagnetic field existed as far back as 2.7 billion years ago.[23] Strangely the present geomagnetic field is much stronger than it has been, on the average, over the long term.[24] This is rather unexpected for an Earth which is apparently slowly slowing down. One would expect the geomagnetic field to slowly weaken in sync with this. Outright reversals of the field seem to have occurred frequently over geological time. It seems likely that the geomagnetic field will either increase in strength or decay through zero and change polarity. The history of the geomagnetic field does not imply its complete disappearance.[25] The decay of this variable is very important, for we do not know why it is occurring at all

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and, particularly, why it is happening so fast.

Is the decay of the geomagnetic field real? Geophysicists are agreed that the dipole component (presently 90% of the field) is definitely decreasing. But G. B. Dalrymple points out that the non-dipole component (presently 10%) has been increasing enough to almost compensate for the waning dipole component. In effect, the geomagnetic field seems to be becoming less and less "dipolish".[26]

The non-dipole field is not static. Maps of it show features drifting across the globe, rotating, changing form, waxing and waning. Whatever generates the total geomagnetic field must be able to account for these changes. The complexity of the changing non-dipole field implies a similar complexity in the structure of the main geodynamo and, perhaps secondary dynamos. The same is true for any other proposed mechanisms of field generation.

We don't know exactly how the favored dynamo model can account for all the subtleties of the field. The problem is made more difficult by the sudden changes in the panorama of the secular variations noted below.

The greater part of the magnetic field seems to drift slowly westwards—for the time being. H. Takeuchi mentions that the rate of westward drift is about 0.18° in longitude per annum. At that rate the pattern will go around the Earth in approximately 2,000 years. Takeuchi notes:

> Generally, changes within the Earth occur very slowly, encompassing millions and even billions of years; 2,000 years is a very short time in comparison. Indeed, this is an important key to the explanation of the Earth's magnetism. . .[27]

The westward drift of the non-dipole field has been ascribed to:

1. Slippage between the liquid core and the mantle.
2. Wave motion of fluids in the core.

But none of these appealing theories are workable because the westward drift seems to be confined mainly to the Atlantic hemisphere—from 90° W to 90° E longitude In this region some features move as much as 10 km, but in the Pacific hemisphere there is hardly any westward drift.[28]

The Reader may be puzzled by this. How can part of the field drift while

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another segment does not - and how does this overlay a fixed field? As will be seen in the chapter which deals with the Inner Sun, the apparent motion of the magnetic field is only an illusion. Even its dipolar nature may itself be an illusion. Tremendous changes occur at the core. Even the waxing and waning in the strength of the magnetic field is an illusion. It simply has to do with "cells" which change their orientation towards one another all the time. When they're all aligned in a certain direction then the field may appear to be strong. But they can also cancel each other out—in part or even totally. Thus, the features which we are seeing are largely the result of systematic changes in the "dynamo" except of course for the fixed lobes and spots which relate to fixed magnetism deep inside the crust.

The Earth's magnetic field undergoes extremely rapid changes which seem to be at odds with the idea of a ponderous fluid circulating under extremely high pressures. According to Stan Cisowski, of the University of California, Santa Barbara, the magnetic field changed direction three times about 700,000 years ago. Cisowski says that each reversal of polarity seems to have taken only a few hundred years rather than 2,000 to 3,000 years, as many geologists believe. His results come from a preliminary analysis of a core of sediment collected near the Philippines as part of the Ocean Drilling Program.[29]

The Steens mountain lies in southeastern Oregon. In a 150 m thick section of layered basalt flows one finds an amazingly detailed magnetic picture of what happens to the geomagnetic field during a reversal. The Steens mountain record of a reversal produced evidence of rapid changes. Geomagnetic impulses with astonishingly high rates of change occurred, suggesting that liquid velocity in the Earth's core increased during geomagnetic reversals. The geomagnetic field changed by as much as 3° per day, which implied that the liquid core was brushing the overlying mantle at a velocity of 1 km/hr—far faster than anyone had supposed. (*New York Times*, 11 July 1989).

In 1990, R. T. Merrill and P. L. McFadden, writing in *Science*, found the Steens Mountain observations hard to believe. They stated that if this is the way that the field changes, then polarity transitions "exhibit astonishing properties." They were amazed that the Earth's magnetic field could change direction by a few tens of degrees in less than a year. The rapid changes in the intensity of the field were also difficult to accept,

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> . . . because mantle shielding should smooth out such rapid changes and because **the changes seem to require unrealistically high fluid velocities in the core**.[30]

In 1972, R. L. Wilson *et al.* published a statistical survey of known examples of field reversals. They found that in some cases, the field was quite strong at intermediate directions. In 1975, J. Shaw, at Liverpool University, took the studies further. He found clear evidence for "a metastable state of the Earth's dipole in a direction at 90° to the Earth's axis. . ."[31] These two studies suggested that the Earth could have a magnetic field which is equally strong at angles different to what one would expect from the dynamo. R. L. Wilson found it to be strong at "intermediate directions" while Shaw found it to be strong at 90° to the Earth's axis. Shaw felt there would be implications for the dynamo idea.

No one ever expected the magnetic field to behave like this. It should be clear to the Reader that the "dynamo" does many unexpected things. Its changes are so many and varied—and they sometimes occur extremely rapidly. Even its static features are totally unexpected. I seriously wonder if the magnetic field really is the product of a molten core. It seems to me that there are many open questions and so few answers.

THE GREAT MAGNETIC JERK

All these scientists have been trying to convince us that the Earth is a nice, solid, tightly packed world. We have seen how the magnetic field seems to rotate separately from the Earth itself as if there was no physical connection between it and the solid Earth above.

1969 was a pretty normal year for us here on the surface of the Earth. The Earth did not behave strangely in any way. The days were as long as they ever were. The rotation was quite normal. But thousands of miles beneath the Earth's crust something strange happened. In 1983 K. A. Whaler wrote:

> It now seems that around 1969 a spectacular change took place in the geomagnetic field. The change was almost synchronous over the whole of the Earth's surface, took place in less than two years, and is now known to have consisted of a 'jerk': a step change in secular acceleration of the magnetic field that has its origin inside the Earth.[32]

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In 1982 Malin and Hodder wrote:

> This ‘jerk’ is obvious in records of secular variation, particularly those from European observatories. For over 20 years the secular variation was about 6 arcmin/yr and was drifting slowly downward. In 1969, the curve began to rise with a much steeper slope.[33]

If the Earth’s magnetic field is produced by currents inside the Earth then how can one account for the magnetic jerk which took place in 1969? The magnetic field is supposed to be the product of convection currents in the core. Yet, what changed this? Surely the changes in the magnetic field must have been accompanied by some physical change or some massive event inside the Earth’s core? Why was none detected? There is definitely nothing external which could have caused it.

This is an example of the sudden nature of many geomagnetic phenomenon. They happen suddenly, within the Earth, without a rationale, and we also can’t link it to any physical event. Is this not what one might expect from a free-floating star lying at the center of a Hollow Planet?

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Chapter 9: The Inner Sun

The idea of a nuclear Sun inside the Earth must surely seem bizarre to the Reader. As I set out to test these old Hollow Earth theories, I wondered how one would know if there was a Sun inside the Earth. So I did a bit of reading and thinking about geophysics. Various facts led me to entertain thoughts of a nuclear fission Sun. My train of thought was originally triggered when I discovered that a few high level nuclear explosions could knock out all the electronics across the United States (in a nuclear war scenario for example). This is because a nuclear explosion creates a powerful EMP (Electromagnetic Pulse) shock wave. It can knock out the sensitive electronics in computers as well as the electrical systems of almost all motor vehicles.

It occurred to me that a naturally occurring nuclear reaction inside the Earth might perhaps be responsible for the Earth's magnetic field. The idea that the Earth's magnetic field could be caused by a nuclear reaction inside the Earth seemed pretty freaky, but it seemed to have possibilities. The strange behavior of the magnetic field seemed to confirm that it couldn't be caused by a sluggish liquid circulating about the outer core.

Another clue to the possible nuclear origin of the Inner Sun is this: In the early days of space exploration H. A. Bomke detected magnetohydrodynamic waves (electromagnetic waves) in the Earth's outer atmosphere which were generated by high altitude nuclear explosions. Masahisa Sugiura discovered similar waves which were generated by natural causes in the outer atmosphere of the Earth and transmitted along the lines of magnetic force to the Earth in the northern and southern auroral zones.

There are also electric (telluric) currents which flow in the surface layer of the Earth's crust. The ground is electrically conducting and its resistivity varies markedly with depth. It has been found that these currents come from the polar regions. These currents change in sympathy with magnetic disturbances and auroras.

The aurora is caused by charged particles—supposedly from the Sun. Auroras have been observed in the vicinity of nuclear tests—even at equatorial latitudes. Nuclear explosions create lots of ionized matter. So the aurora and its associated light and its ionized particles would all seem to be

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consistent with a nuclear reaction. I wondered if a nuclear reaction at the center of the Earth could cause ionized matter to exit the Earth via polar entrances, thereby helping to create the aurora—over and above the particles which come from the Sun.

The next realization was that matter arranged itself according to density when the Earth formed—that's what scientists expect to happen. Denser matter at the center of the Earth, and less dense material as one moves further away from the center and so on up through the atmosphere until one reached the edge of space.

Why shouldn't heavy metals such as uranium for example exist in the Earth's core? Scientists say that uranium is a trace metal which does not occur naturally. They do not expect it to reside inside the Earth. It also decays. Let us assume that a solid Earth formed originally—that it was compact and tightly packed in the same way that scientists these days expect it to be. No one knows what happens to matter under those conditions. I have heard fringe ideas floating around about miniature Black Holes inside the Earth. This was once suggested by some Russian scientists. I also came across a gentleman with some scientific background who irritated geologists and geophysicists by proposing that matter was being created at the center of the Earth. I have wondered, in my own simplistic way, whether some sort of natural enriching process is kicked off automatically when matter is that tightly packed. It's a truly stupid idea I know—even by my own standards! Yet, no one can truly refute it because no one has recreated those conditions and studied the consequences. There might be natural processes which kick in under such conditions, processes which we don't know about yet. And we also must not forget the possibility of cold fusion either.

A small amount of uranium or plutonium would be enough to start a nuclear reaction. One by one these simple facts and possibilities made me think that a naturally occurring nuclear reaction inside the Earth might be a workable proposition.

A NUCLEAR SCIENTIST'S THOUGHTS

I was eager to run these ideas by some scientists. Had scientists thought of such a possibility? I discussed these ideas with Dr. Gordeev often. He commented to me that the idea of an iron core seemed somewhat improbable to him. Why did scientists settle on iron he asked? Why not something

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heavier for example, like a gold core? My suggestion regarding the core is even more radical: Why not uranium or plutonium or radium or some matter beyond our ken?

Surely the heaviest materials would settle near the center of the Earth? The extremely heavy metals also happen to be unstable, and may open up the possibility of nuclear fission. Perhaps too, metals could exist at the center of the Earth unlike anything we know about here on the surface. Perhaps super-unstable matter existed there which could easily trigger even more violent types of nuclear fission reactions than U–235? Why not? Scientists have often speculated about what could exist at such tremendous pressures. They don't really know. They don't know what would happen to matter in the center of the Earth. Who knows how atomic physics behaves under those conditions? Is there some natural enrichment process whereby an iron, lead or gold core could turn into a type of nuclear material?

I first tried to engage scientists on Internet in the Physics news group. I asked the question several times: Has anyone ever explored the physics of a nuclear fission star? I posed this question several times, weeks and months apart, but no one ever responded to it in any way whatsoever. So I gave up.

I wondered if a question to an official organization would elicit a better response. So I approached the South African Atomic Energy corporation. I faxed them the question. Finally I got a response from one of their scientists, Dr. Gawie Notnagel. He was a very kind man and gave freely of his time to discuss my wild idea! Dr. Notnagel apparently has a good knowledge of nuclear fusion as well as fission, and so he deals with questions covering both subjects.

Because of the lack of response to my questions, I wanted to be careful not to blow it! Postulating a nuclear reaction inside the Earth seemed too radical, so I painted another picture which I felt would not alienate a serious scientist too much.

I proposed to Dr. Notnagel that perhaps Jupiter had a naturally occurring nuclear fission reaction inside it. I hope to still have the chance to write Hollow Planets II, wherein I will deal with Jupiter, and other outer planets in detail. The reason I proposed Jupiter was because so many facts suggest that Jupiter could be a star. Jupiter radiates more heat than it receives from the Sun. Jupiter has often been proposed as being slightly too small to be a star. Many astronomers have seen Jupiter as a star-wannabe or perhaps even as a star in the making.

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In the 1960s Raymond Hide of the Massachusetts Institute of Technology proposed that the Great Red spot of Jupiter was caused by a “surface feature”. This theory enjoyed considerable popularity amongst scientists of the time. This theory proposed that something deep beneath the clouds was causing the great Red spot. The idea is something akin to smoke rising from a chimney. What causes this? He blamed the Great Red spot on some mysterious “feature” deep beneath the clouds of Jupiter.

A discussion of theories about the Great Red spot is beyond the scope of this chapter. Suffice to say that I proposed to Dr. Notnagel that perhaps a naturally occurring nuclear fission reaction inside Jupiter was causing the Great Red spot. This reaction might be the answer to Mr. Hide’s mysterious “feature”. Mr. Hide had thought in terms of a “mountain” or a “depression”. So the concept of a depression on Jupiter made me wonder if perhaps Jupiter was hollow and had a hole in its crust from which hot gases were rising like smoke from a chimney stack. Could these gases be the cause of the Great Red spot? Would this explain why this atmospheric feature could persist literally for centuries? Hide was convinced that the movements (and the disappearance and reappearance) of the Great Red spot could be accounted for by way of a physical phenomenon deep down in the planet.

Hide’s theory seemed so good, and most scientists agreed with it, yet no mechanism existed which could explain it. Ultimately, scientists drifted to the stable storm idea which is the currently popular explanation.

There is a considerable difference between nuclear fission and nuclear fusion. Our Sun supposedly runs on a nuclear fusion engine. Fusion is when light atoms (e.g. hydrogen or perhaps even helium) combine. When they combine they give off an enormous amount of energy.

Fission is the opposite of fusion. Fission occurs at the other end of the scale. Fission occurs when heavy and unstable atoms are split. During this splitting process a great deal of energy is released.

I asked Dr. Notnagel the big question: Could a nuclear fission reaction be going on inside Jupiter? Astronomers are so accustomed to thinking purely in terms of fusion, but what if at the center of Jupiter there was a fission reaction instead?

In March and April of 1997 I thus engaged in some very long telephonic discussions with Dr. Notnagel to get the thoughts of a serious scientist on the matter. He willingly gave of his free time, and listened to my madness (for which I am very grateful).

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He told me that uranium is a trace metal and occurs in very small quantities in nature. U–238 is the most common form of uranium in nature. Only 0.7% of the uranium found in nature is U–235. He told me that the bulk of naturally occurring uranium would be unable to sustain a nuclear reaction because its ability to sustain the capture of neutrons is too low. For a viable nuclear reaction it must be enriched to U–235 or one must add a moderator. Water is the only natural moderator available. His mention of water came as a pleasant surprise to me.

Dr. Notnagel explained that the principle of nuclear fusion was different. Fusion does not require a critical mass. The nuclear forces act at a very close range only. The atoms must be brought close together. This is difficult because of the Coulomb repulsion which exists between the atoms. Considerable pressure is required to overcome this repulsive force. Once this repulsive force is overcome, the atoms can then fuse and release considerable energy. This reaction is prevented from becoming a run-away reaction because the star then expands. This expansion slows down the reaction. The power output is produced in a relatively constant manner.

One also needs a temperature of 100 million degrees in order to start the reaction. The inside of the Sun supposedly has a temperature of 50 million degrees. Even though this is not enough to activate the reaction fully, it nevertheless allows some of the atoms to engage in the fusion process. This is enough to generate light and heat and to enable the Sun to sustain this reaction for billions of years.

Dr. Notnagel felt that a nuclear fission star would burn out very quickly in a century or two. He suggested that fission alone wasn’t good enough. **He suggested that a fission-hybrid process might actually work better.** The problem lies in generating new fuel for the process to continue.

We discussed how a natural fission reaction could occur. I reminded him of the discovery by French scientists of a place in Gabon, West Africa where the evidence strongly suggested a nuclear fission reaction had taken place on the surface of the Earth (a most unlikely spot I thought).

Dr. Notnagel explained that water would be a very necessary ingredient for a natural nuclear fission reaction. There wouldn’t be enough water on Jupiter—and anyway, Jupiter is gaseous. This gave me the chance to switch the discussion to a more Earth-like scenario! Ok, how about the Earth, where we do have water present—what would happen?

He said that U–238 would only be able to capture the very slow

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neutrons. Fast neutrons are best captured by enriched (U–235). Slow neutrons would be good for a slow naturally occurring reaction. Water acting as a moderator, would slow down the neutrons providing the opportunity for U–238 to capture the neutrons.

Dr. Notnagel said that a major problem with the idea of a “Fission Star” would be that there simply is not enough uranium around. Uranium is a trace element, possibly produced only through super-nova explosions. It does not occur naturally.

With reference to the Gabon natural nuclear reactor, he explained that water had played a key role. Water flowing through a uranium deposit had washed the uranium into a water-filled basin. The water had gathered the uranium over a wide area. Water had also acted as a moderator slowing down the neutrons and improving the chances of capture by the U–238.

With nuclear fission one needs a critical mass. One needs a minimum mass which can intercept these slow moving neutrons. The density of the packing of intercepting nuclei also increases the chances of capturing slow moving neutrons. In Gabon water had been key in bringing enough uranium together and in producing the required conditions for a natural fission reaction.

Dr. Notnagel said that other problems would exist with such a star. If a fission star were to consist of enriched uranium it would explode. It would result in a runaway process. He doubted whether a fission star (not enriched), would be able to shine. It would, at the very best have a low luminosity—and most likely none at all.

He told me that natural fusion reactions take place inside the Earth, **but they operate on a very small scale.** I found that surprising. He also said that a naturally occurring fission reaction would not be violent at all. It might at best result in boiling water—and it definitely would not give off light like a star. I asked if magnetism would have any effect upon the reaction, but he said it would not.

Dr. Notnagel felt that a Fission star could never occur naturally. He kept thinking in terms of such a star occurring naturally in space. I did not want to propose a nuclear fission star inside the Earth because I was scared it would alienate him totally, so I put the idea aside, instead asking him about a “hypothetical situation.”

He did admit to me that it is dangerous, even as a scientist, to say “never”. He was open and candidly stated that scientists had often been

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proven wrong. The best they could really say was that it was highly probable that such a thing could not work. I appreciated his honesty and efforts in helping me in his own time.

In reviewing what he told me, I would like to make a few points. Long before contacting any scientists I too had wondered if there was enough uranium inside the Earth to start a naturally occurring nuclear reaction. Most people (mistakenly) think that volcanoes are caused by molten materials rising from the Earth's center. This is not possible because the distances involved are enormous, and such slow moving materials would cool and become rock-hard long before they had travelled the thousands of miles upwards to reach the surface. Scientists had long since realized that the lava which pours from volcanoes is naturally radioactive. This is how scientists are able to date rocks—because the lava from which these rocks form is slightly radioactive. Decayed uranium turns into radium. Scientists thus theories that radium is probably to blame. The evidence suggests that lava forms no more than 20 miles beneath the Earth's surface due to the accumulated heat from decaying radium and uranium.

There are lots of volcanically active areas on the Earth. It seems as if there is quite a lot of radium in the Earth's crust. The crust is of course only a small part of the Earth. Remember that this is far away from the center of the Earth. If there is still some radium left here near the surface after some 4 billion years of Earth history then surely, deep down in the Earth there was much much more when the Earth originally formed? Remember too, our volcanoes are probably driven by what is left after billions of years of radioactive decay. So how much do you suppose there was to begin with?

Uranium has a half-life of 710 million years under current conditions. That means that 710 million years ago there was twice as much uranium in the Earth's crust as there is now. 1.42 billion years ago there was four times as much as there is now. If we extrapolate that, taking into account the Earth's age of 4.6 billion years, then we can say that the original amount of uranium in the Earth was about 8 times as much as there is now. (I think extrapolation is a dangerous game to play—although scientists engage in it all the time. So let me say at the outset that one should take this answer as an indication only that there must have been a lot more uranium in the Earth in the past. Let's not take these figures too literally). It seems to me that there must have been enough uranium around originally to kick off at least one natural nuclear reaction inside the Earth.

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What of water inside the Earth? Gravity pulls everything downwards. Surely the Earth has much more water than just the oceans and lakes seen here on the surface. Much water may lie beneath the surface—having seeped ever deeper into a solid planet. What if water dissolved and eroded its way into the Earth and helped to kick off the natural nuclear fission process to begin with?

From what Dr. Notnagel told me, water could be a key ingredient in assisting the process. But then again, under those pressures and conditions who knows what kind of matter might be there to begin with. Perhaps some unknown material is even more suitable for a nuclear reaction? Maybe some hybrid process to takes effect too? Who knows? We should remain open minded to other possibilities as well.

THE EARTH'S HEAT

Most people live under the mistaken impression that the Earth is cooling down. The image of a molten Earth with a thin crust on top remains etched in the minds of many. Richard Milton writes:

> Although it was once believed that the Earth was cooling as its molten interior lost heat, it is now known that the Earth's overall temperature is roughly constant, since heat loss from the surface is balanced by heat generated within the crust by radioactive decay.[1]

The Earth is not cooling down. We really do not even know if it was losing any heat at all to begin with. Not even the Russians, with the deepest hole ever drilled managed to get beneath the crust to see if things down there were really as predicted. The idea of a cooling Earth is based on the ideas of scientists. But is the Earth's temperature constant only because of the decay of radioactive materials or does the Inner Sun help in other ways to keep the climate warm?

What about Venus? There has been much debate over the origin of the heat on Venus. Is all of Venus's heat due merely to the Greenhouse effect? Or could a natural nuclear reaction inside Venus be driving the process? What of Mars which has the largest (extinct) volcano in the solar system? What of Jupiter's moon Io, which spews forth lava so high that some of it goes into space? Are there perhaps nuclear reactions driving these planets? Jupiter has the strongest magnetic field in the solar system. It has a magnetic

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field stronger than that of the Sun. What causes it? Or is there a nuclear fission or hybrid reaction going on inside a planet we believe to be gaseous?

NATURAL FISSION REACTORS

The idea of a naturally occurring nuclear fission reaction on Earth is not quite as bizarre as it may initially seem. Scientists have been discussing this possibility for quite some time.

The main evidence for the past presence of natural fission reactors comes in the form of uranium ores that are depleted in U–235. The main site lies at Oklo in Gabon. What follows is a short history of the discovery of the phenomenon, as discussed during a symposium. In June 1972, a team was working under the direction of Dr. H. V. Bouzigues at the CEA service laboratory in France. They noticed an anomaly in the abundance of the U–235 isotope. Sometime later, much larger depletions of this isotope were discovered in uranium samples from this source. They traced this back to the Oklo deposit. Mme M. Neuilly and co-workers of CEA measured the ratios of fission-product rare earths detected in the ore. This was the first positive proof of the hypothesis that a natural chain reaction was responsible for the depletion.

A report in *Nature* about an international symposium held in Gabon in 1975 states:

> It was pointed out that at the time of the reaction the natural abundance of the relatively fast-decaying U–235 isotope was more than 3%. This natural ‘enrichment’, helped by the moderation of the fission neutrons by the water content of the soil which enhanced their fission efficiency, and possibly by the relative absence of neutron-absorbing elements in the surroundings, allowed a nuclear chain reaction to develop. It is perhaps worth mentioning that such a natural chain reaction had already been predicted, on theoretical grounds, by several scientists, notably by P. K. Kuroda as early as 1956.[2]

Further investigations followed:

> Investigations have shown that there was not just one reactor at Oklo; **At least six ‘reaction zones’ over a relatively small area (a few thousand square meters) have been identified. A question exercising not a few**

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> **minds was whether one of these was a 'primary' reactor and the others either secondaries or its lineal descendants. The reactors, like reproducing organisms, seem to have been 'propagating' themselves**. R. Naudet, a French scientist, in true detective story style, termed this the 'Oklo mystery'! The age of the phenomenon has now been put back from approximately 1.8 billion years to nearer 2 billion years; **The duration of the entire drama at Oklo, from the first spark to the last smoulderings of the atomic fuel has also been extended from approximately 500,000 years to 2 (or perhaps several) million years.**[3]
>
> **It is believed that the Oklo reaction zones reached 400°C**. The Oklo zones are anomalous in two other ways: 1. there is a near-absence of quartz in the high-grade ores; and 2. **No one can say how relatively low-grade ore (0.2 to 0.9%) was concentrated to 5 to 70%.**[4]

At Okelobondo, 1 km south of Oklo one also finds evidence of sustained natural fission reactions.

> Sedimentary deposits of the Colorado Plateau are depleted in U–235 by about 0.03%. Since the total uranium reserves of the Plateau are estimated to be 400,000 tons, **there has been a net loss of some 5 tons of U–235. This represents considerable fission energy and suggests the possibility of natural fission reactors**.[5]

At Rabbit Lake, Canada the uranium ore deposits here are younger and not as richly concentrated as those at Oklo. Nevertheless, the uranium distribution is very in-homogeneous, and there are indications of isotopic redistribution. There are, however, no direct signs of the past presence of natural fission reactors.[6]

To summarize, our interest lies in the feasibility of there being natural nuclear reactors—even here on the surface of the Earth. Add to this the possibility of having existed far more U–235 concentrations in the past. All of this taken together should clearly indicate that the idea of the Earth (and other planets) having been hollowed out by enormous nuclear reactions, might not that farfetched. Even such a small site as Oklo, is estimated to have sustained a nuclear reaction which lasted anything from 500,000 years to several million years. The loss of 5 tons of U–235 attests to the power of this

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reaction. **What puzzled the scientists was how low grade uranium ore naturally enriched and started a fission process?** Yet the evidence shows that it did indeed happen—right here on the surface.

Dr. Notnagel had told me that normally uranium–235 only makes up 0.7% of the average uranium deposit. Yet at this site, scientists determined that at the time of the reaction 3% of the uranium was U-235. Considerable enrichment had occurred naturally.

If even a single site with 400,000 tons of U-238 can enrich itself and set off a chain reaction which uses up 5 tons of uranium then there seems to be a pretty strong case for naturally occurring nuclear fission reactors. Another puzzlement to the French scientists was how one reaction seemed to spread and kick off another.

That this little nuclear reaction could produce temperatures of 400° C and run for several million years, would seem to support the idea of a natural nuclear process occurring in nature right here on or in the Earth.

A key point made by these scientists is that uranium has a half-life of 710 million years and therefore the Earth should have had considerably more uranium in the past. What they did not consider was that deep inside the Earth there may have been even more uranium than here near the surface. Perhaps enrichment there is even easier than here on the surface?

NUCLEAR FUSION

We must not make the error of imagining that we know everything there is to know about either nuclear fission or nuclear fusion. Scientists have struggled for centuries to understand how the Sun can continuously produce light and heat for billions of years. It became obvious early on that the Sun was not on fire! Such a fire would not last long. This all changed when nuclear physics became a reality. Overnight it seemed we had solved the problem.

The Sun’s hydrogen composition makes it a prime candidate for nuclear fusion. We’ve built hydrogen bombs and successfully exploded them—so our understanding of fusion seems complete. But is it?

Scientists expect a certain amount of neutrinos to be produced by our Sun’s nuclear fusion processes. The problem is that all attempts at detecting these neutrinos keep resulting in us coming up with too few of them. Experiment after experiment keeps coming up drastically short. Where are

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the neutrinos which the Sun's hydrogen fusion processes? Nobody knows.

Could the Sun be working on some sort of hybrid principle? Could there be other unknown processes at work on this Star? I think we should keep an open mind on this one.

Neutrinos carry no electric charge and are possibly massless. They pass right through the entire Earth as if it were not there. A very, very few, however, are captured in huge, fluid-filled tanks built by physicists.

Even the most modern, sophisticated neutrino detectors count only about one-third the number of neutrinos that the Sun "should" be sending in our direction—according to our best theories on the nuclear reactions in the solar core. To this classical neutrino problem has been added the discovery that the solar neutrino flux varies in ways difficult to explain. P. Sturrock and G. Walther, at Stanford University, scrutinized 20 years of data from a detector deep in the Homestead Mine in South Dakota and find that the neutrino flux seems to peak every 21.3 days, varying as much as 30% to 100%.[6]

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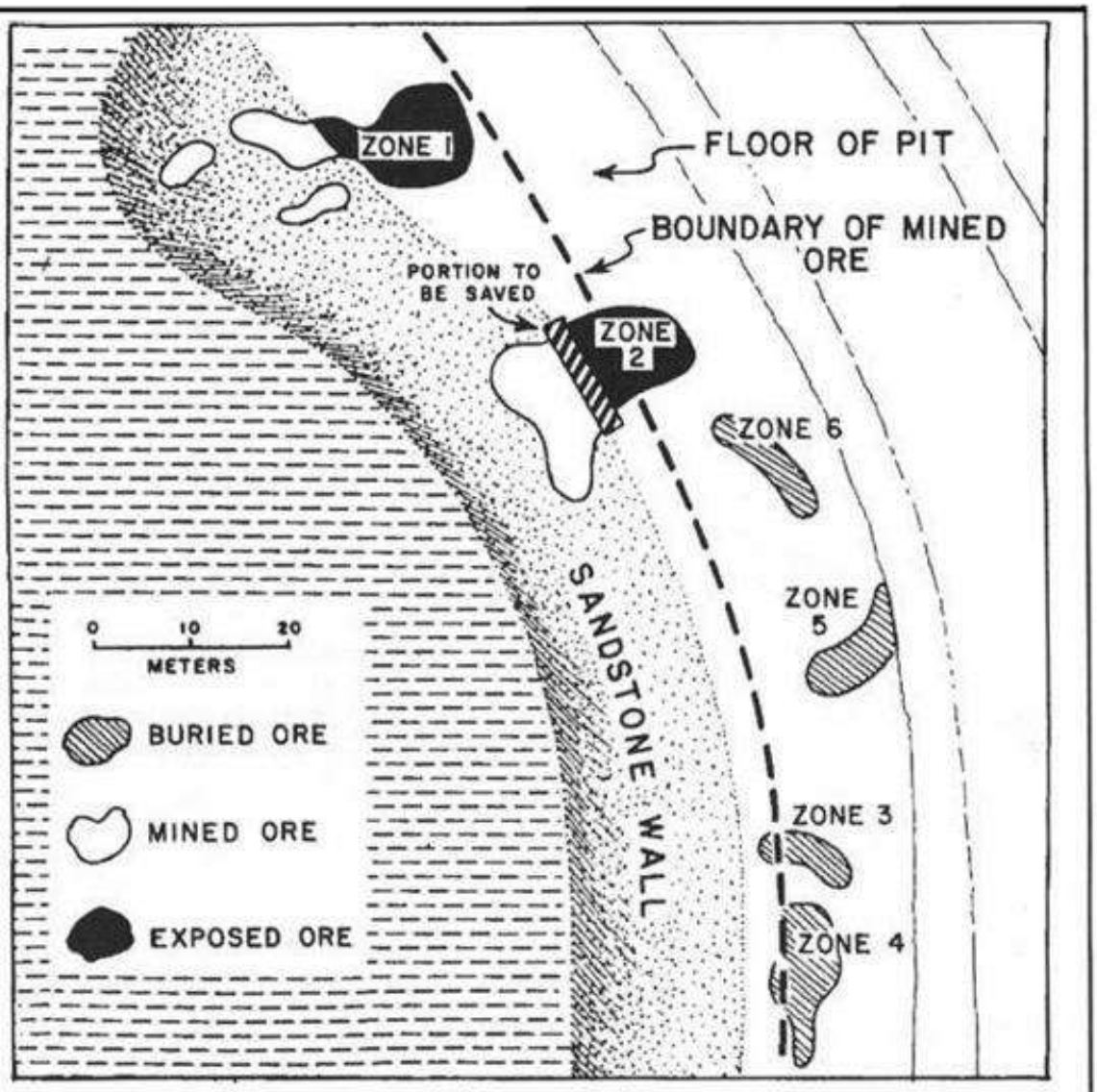

Figure 9.1

Six of the natural nuclear reactor zones at Oklo were located in lenses of exceptionally rich ore. Reprinted by permission from *Nature* Vol. 256 pg. 264 ©1975 MacMillan Magazines Ltd.

Early neutrino experiments were unable to determine the direction the neutrinos came from. This problem was overcome in Japan's Kamiokande II neutrino detector.

They were able to establish that neutrinos do in fact come from the direction of the Sun.[7]

However, more recent results from the Super-Kamiokande detector raise new questions. The first 102 days of neutrino data from it suggests that the

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solar neutrino flux is greater during the night than during the day. It also shows that neutrino production varies during the year.[8]

The nighttime neutrinos definitely make it difficult to account for the Sun as the one and only neutrino producer. It makes one wonder where the other neutrinos might be coming from.

I raise these issues as a word of caution. After centuries of study we still do not understand our own star properly. Does the Sun really run on hydrogen fusion? I also wouldn't want to rule out the possibility of some kind of hybrid system.

INNER SUN: COLD FUSION?

When I discussed the idea of an Inner Sun with Dr. Gordeev, he said that I should not rule out cold fusion as a possible mechanism for driving the Inner Sun. The subject of cold fusion doesn't seem to enjoy much credibility in the USA. Some scientists regard cold fusion as a pseudo-science. Yet many countries in the world are pouring enormous sums of money into hard scientific research on the matter.

In a recent issue of the *Journal of Scientific Exploration*, E. Storms required a staggering 59 pages to review recent work on cold fusion. Based on more than 190 studies (his bibliography runs for 12 pages), Storms reveals just how seriously some "rogue" scientists view cold fusion as a real phenomenon and future energy source. Reflecting the antagonism of the "hot-fusion" community, the U.S. expenditures on cold fusion probably do not exceed $1 million per annum. The Japanese, in contrast, spend about $100 million per annum on research. Cold fusion is openly investigated elsewhere around the planet. Storms writes:

> Evidence for large and reproducible energy generation as well as various nuclear reactions, in addition to fusion, **from a variety of environments and methods is accumulating. The field can no longer be dismissed by invoking** obvious error or prosaic explanations.[9]

The Reader should take note that nuclear physics is expanding, and that there may be much more out there than mere "hot" fission and fusion as we now understand it. There is much we do not know about the complex subject of nuclear physics. There probably are processes which we have never even dreamt of. There may also be hybrid processes capable of working under

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conditions we would consider impossible. The editor of *Infinite Energy* reproached the *Wall Street Journal* for its derogative comments about cold fusion (28 Feb 1997). He asked:

> What are you going to tell your fossil-fuel industry readers when they learn that their obituary has already been written **by carefully documented**, **meticulous experiments that show there is something**, **indeed**, **very new under the Sun?**[10]

Arthur C. Clarke, ever the futurist, and no slouch when it comes to accurate scientific prophecy, declined to talk about space travel in an interview with Discover. He wanted to talk instead about the "new energy revolution." Clarke stated:

> Very few Americans seem to know what is happening, which is incredible. It's all over the world, except in the United States. There are hundreds of laboratories doing it, they've got patents all over the place. **The prototypes are on sale now. There are 7,000 units operating in Russia right now and no one in the United States seems to know about it**.[11]

Some scientists have already discussed the possibility of cold fusion occurring inside the Earth. P. Palmer, a geophysicist has already suggested this. Helium-3 emanating from inside the Earth has been regarded by some as an indication that cold fusion might be taking place deep down inside the Earth. The leader of one research team, Jones, has said that tritium detected in the gases from volcanoes is further evidence of cold fusion inside the Earth. Jones has gone on to speculate that perhaps the excess heat generated by Jupiter might be produced by cold fusion deep within it.[12]

ELECTRICALLY CHARGED SUN?

Let me point out other things which show that we really must not be so smug in thinking that we really understand the fusion which drives our Sun. Astrophysicists generally deny that the Sun is electrically charged. The Sun produces too few neutrinos, contrary to the denial that the Sun is not electrically charged: V. A. Bailey claims that the magnetic field measurements from the

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Pioneer 5, Explorer 10, and Mariner 2 are consistent with the hypothesis that the Sun possesses a large negative electrical charge. For example, Pioneer 5 reported a quiet-time magnetic field perpendicular to the ecliptic; a fact later confirmed by Explorer 10 and Mariner 2. During one quiet period, the field component perpendicular to the ecliptic was as high as 15 gammas, implying a lower limit of solar charge of 3.3×10^{26} E.S.U.—negative in sign.

Bailey believes that the hypothesis of a highly charged Sun explains: "(a) the Sun's present north polar magnetic field strength; (b) the maximum energy, about 10^{19} eV of a primary cosmic ray particle. . ."[13]

We should not dogmatically believe that we fully understand the processes which are occurring in the Sun. The Earth's Inner Sun might also carry an electric charge which effects its nuclear processes. There is much which we do not fully understand so perhaps we should be open-minded.

INNER EARTH NUCLEAR PROCESSES

When physicists installed nuclear particle detectors deep in a mine in the Kolar Gold Fields in India, they hoped to measure particles created by highly penetrating neutrinos arriving from the cosmos. **They found instead immense showers of nuclear particles coming**, **not from above as expected**, **but from the sides and even below!** These huge showers of 1,000 or more different particles are called 'anomalous cascades'. **Neutrinos are the only known particles capable of penetrating the entire Earth to create the upwardly directed showers**, **but ordinary neutrinos do not seem to have enough energy to give birth to the anomalous cascades**.[14]

The Sun creates neutrinos. But most neutrinos are not expected to have enough energy to move through a solid Earth. Yet here were neutrinos passing through the Earth from all sides—and even from below. These scientists found these anomalous cascades to be too energetic to be caused by normal neutrinos. This raises two possibilities about the structure of the Earth:

What if the Earth's crust is thinner than scientists expect with their current solid Earth models? If the Earth is hollow then neutrinos would be able to penetrate the Earth more easily and therefore produce the results which the scientists found. Could the Inner Sun also be a producer of some of the neutrinos which are rising from the core of the Earth?

Since those experiments scientists have made plans to build "telescopes"

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which are pointed downwards and which detect these particles coming from below. Many European nations as well as the USA have been building such “telescopes” which are located in the Mediterranean. The largest however will be located deep in the ice of the Antarctic continent. These neutrinos point to some kind of radioactive/nuclear process going on inside the Earth. Could it be an Inner Sun?

WHEN THE INNER SUN SHINES

Let us now examine possible evidence that the Earth itself is luminous! In earlier chapters we examined this possibility for Venus.

The impression one gets of the aurora is that it is a curtain of light playing in the upper atmosphere. Sometimes it can be bright, but not always. On extremely rare occasions the aurora has produced a shadow. Could a diffuse light such as the aurora actually light up the Moon for example? The Moon is approximately 238,000 mi away—which is about 30 Earth diameters away. This is quite a considerable distance. The Moon is a large object. Lighting up the face of the Moon is quite a considerable task.

The Moon lights up the night side of the Earth—as we all know. The full Moon provides a splendid example of the amount of light which the Moon can reflect. But there are times when the Earth lights up the Moon. This occurs shortly after New Moon. New Moon is when the Moon lies between the Earth and the Sun and is invisible for a few days. As the Moon continues its motion a thin crescent becomes visible in the early evenings. It is at this time that one can see the “old Moon in the new Moon’s arms.” At this time one can see a vague circular outline beyond the crescent. Although the Sun is lighting up the crescent brightly, it is the Earth which is reflecting light to light up the remainder of the Moon. At this time the Moon is lying in direction almost in line with the Sun. Thus the entire day side of the Earth is lying behind the Moon. The Earth then acts as a gigantic mirror reflecting light from the Sun onto the darkened Earth-side of the Moon. As the Moon progresses towards first quarter this effect soon disappears. This is because from the Moon’s perspective the “Full Earth” is dwindling and less light is being reflected towards the Moon.

The Moon continues upon its journey and a week later we have Full Moon. As Full Moon approaches, from the vantage point of the Moon the Earth becomes an ever darker orb. Sometimes the Earth crosses directly

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between the Moon and the Sun. At such times the Earth cuts off the light going to the Moon. The Earth's atmosphere however refracts the Sun's light thereby ensuring that the Moon rarely disappears from view. If the Earth did not have an atmosphere then the Moon would disappear entirely.

It is these eclipses which I want to draw attention to. There is a mystery surrounding some of these eclipses. As the Reader will appreciate, at the time of these eclipses, the Earth's night side is in full view, and apart from the light streaming around the edges of the Earth, there is no other light shining on the Moon. The outer planets like Mars are too far away, behind the Moon to affect it. Of the Inner planets, even Venus is too far away to do anything. When Venus is nearby, it too has its night side pointed to the Moon.

It is at this point that a mystery surfaces. At this time, there is no light other than the light of the Sun which can affect the Moon. But is this really so?

Astronomers have noted that these eclipses of the Moon are variable in brightness. Sometimes they are very dark. At other times they are extremely bright. The dark eclipses have been relatively well explained by way of dust particles in the Earth's atmosphere. Volcanic eruptions are the main culprits. If the Earth's atmosphere is dust laden then the eclipses of the Moon are very dark—sometimes the Moon disappears totally.

But then there are times when the Moon is exceedingly bright. Far too bright. Some observers have noted extraordinarily bright auroras at the time —and have wondered whether the Earth's aurora can possibly light up the Moon?

Can this dim, diffuse light from charged particles really light up the Moon from such a distance? Remember, it takes the entire sunlit face of the Earth to barely light up the Moon dimly so you can barely see it after New Moon. Surely the Earth's aurora cannot possibly light up the Moon? The aurora covers only the polar regions in a bright ring. Does the aurora really have the necessary candle power to light up an object 2,160 mi in diameter at a distance of 238,000 mi?

Scientists have stated that the Earth's atmosphere refracts the sunlight thereby ensuring that the Moon does not disappear entirely during a "normal" eclipse. But here too I ask the question: Is there enough light being refracted through the atmosphere alone to account for the Moon's brightness? The Moon has only disappeared totally on rare occasions even though the Earth's shadow is large enough to cover the entire Moon.

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I pose the question: Can the aurora (which can only produce a shadow on the Earth under exceptional conditions) really light up an object the size of the Moon 238,000 mi away? Or are there times when light from inside the Earth is refracted and bent through the cold polar air so that direct inner sunlight can fall on the surface of the Moon?

I spoke to Prof. Neil Davis of the University of Alaska, who is one of the foremost experts in the world on the aurora. I asked him if the aurora could, under exceptional conditions, light up the Moon? Davis informed me that it could not. Either Davis is wrong, or there is something neither he, nor any of us knows about the Earth.

The condensed testimony of several European observers for an event on 19 Mar 1848:

> I wish to call your attention to the fact, which I have clearly ascertained, that during the whole of the late lunar eclipse of 19 March, the shaded surface presented a **luminosity quite unusual**, **probably about three times the intensity of the mean illumination of an eclipsed lunar disc. The light was of a deep-red color. During the totality of the eclipse the light and dark places on the face of the Moon could be almost as well made out as in and ordinary dull moonlight night; and the deep-red color**, **where the sky was clearest**, **was very remarkable from the contrasted whiteness of the stars. The Consul at Ghent**, **who did not know that there was an eclipse**, **wrote to me for an explanation of the deep red color of the Moon at 9 o'clock**.

Another observer in Devonshire, of the same eclipse wrote:

> The appearances were as usual till 20 minutes to 9 at that period and for the space of the next hour, instead of an eclipse, or the umbra of the Earth being the cause of the total obscurity of the Moon, **the whole surface of that body became very quickly and most beautifully illuminated**, **and assumed the appearance of the glowing heat of fire from the furnace**, **rather tinged with deep red**.
>
> **Both observers relate that there was at the time a brilliant Aurora Borealis**, **and suggest that the luminous appearance of the Moon might arise from the reflection of the light shed by this northern effulgence**.

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> In Ireland where the same peculiarity was observed it was noticed that about a quarter of an hour before the end, the appearance was as usual the eclipsed part was nearly black and the rest perfectly bright.[15]

The observation from Ireland notes that before the eclipse ended, the light had stopped lighting up the Moon. It is as if we have a "search-light" effect. Could it be that refracted light from the Inner Sun lit up the Moon for a short while and then left the Moon in total darkness again? Sunsets are red. This is because the red light can travel longer distances through the atmosphere whereas other wavelengths of light cannot. The deep red color in the above observations is therefore of extreme interest. It implies that the light travelled a great distance through the atmosphere before falling on the Moon. Could this light have travelled all the way out of the Inner Earth to be refracted and to then fall upon the Moon?

Following a discussion of very dark eclipses:

> As an instance of the contrary nature, where the Moon has been so strongly illuminated during her presence in the shadow as to admit of the various markings upon her surface being seen with distinctness, and even to lead persons to doubt her being eclipsed mention may be made of the eclipse on the morning of 23 Dec 1703, which was observed by various astronomers in the south of France. **At Avignon**, **during the whole duration of the passage through the Earth's shadow**, **'the Moon appeared extraordinary illuminated**, **and of a very bright red**, **so that it might have been supposed that she was transparent**, **and that the Sun was behind her globe**, **and that his rays passed through in the same manner that they are slightly diaphanous**.[16]

Note again the deep red color. On rare occasions the Earth's aurora is a deep red color. The deep red color on the Moon might not necessarily be related. Perhaps it is the result of light travelling a vast distance through the Earth's Inner and Outer atmospheres.

In those old observations the observers did not have the equipment with which to measure the light intensity objectively. David W. Hughes, writing in *Nature* in 1975, noted that the eclipse of 26 Sept 1950 "was a thousand times brighter than that of 18 Jan 1954." It is extremely significant that this eclipse was measured as being 1,000 times brighter than that of another one which

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took place later. This clearly demonstrates the disparity in the amount of light which reaches the Moon from the Earth.

DANJON'S LAW

In 1975 David W. Hughes wrote a paper in *Nature* in which he came to a conclusion which can only be regarded as extremely strange. Hughes examined "Danjon's Law", which is named after the French astronomer, Danjon who first formulated it in 1920. [*Acad. Sci. Paris*, 171, 1127; 1920].

It is well-known that the Sun goes through sunspot cycles of approximately 11 years. These sunspot cycles are a reflection of solar activity. Danjon had analyses eclipse records going back to three centuries to the time of Tycho Brahe. Using these records he found what he believed was a relationship between the brightness of lunar eclipses and the phase of solar activity. Using his law he then estimated the times of the solar minimum during the 17th, 18th, and 19th centuries. The results showed that minimums occurred from 1584.8 onwards every 10.87 years. [*Acad. Sci. Paris*, 171, 1207; 1920]. The problematic number however is 10.87 years. The solar cycle, as derived from sunspot numbers is 11.2 years.

Danjon's Law can be stated as follows: The Earth's shadow will be very dark and have little color in the two years immediately following a minimum in solar activity. Then, as the solar activity increases, the eclipsed Moon will become brighter and redder. The eclipsed Moon will be at its brightest during the 7th and 8th years after the solar minimum. At this point the Moon will be orange, red or copper in color. After the 8th year, the Moon's brightness drops sharply until it reaches its minimum value. The maximum phase of the solar cycle passes unnoticed. However at the minimum phase there is a sudden and considerable reduction in the color and brightness of the Moon.

In 1958 Vassy had theorized that Danjon's Law could be explained in terms of aerosols which are produced in the upper atmosphere. He supposed that these aerosols were affected by the amount of radiation received from the Sun.

Link, who is a French scientist from the Institut d'Astrophysique in Paris reanalyzed the Danjon's Law to find out what was causing the variations in the brightness of Lunar eclipses. The results were published in *Moon* [11, 137; 1974]. Link found that:

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> . . . the phenomenon behind the law is not the absorption of the light in the terrestrial atmosphere as originally assumed by Danjon but some light source other than the normal refracted solar illumination. The problem is to find this source.

Link also examined Vassy's theoretical explanation of Danjon's Law. Hughes explained:

> Link examines the possible implication of this hypothesis on the twilight and daytime sky as observed from Earth. Looking at two extremes of shadow density he finds the eclipse of 18 Jan 1954 to be a thousand times less luminous than that of 26 Sept 1950. To explain the bright eclipse by aerosol scattering requires an aerosol density such that the twilight brightness would be a hundred times more than observed. The luminance of the daylight sky too is far from that needed to explain Danjon's Law.
>
> Another source of additional light is the luminescence of lunar surface materials. This could be caused by corpuscular radiation striking the Moon during the eclipse or it could be an afterglow from the period preceding the eclipse. But recent laboratory examinations of lunar samples showed that the luminescence is much too low to explain the eclipse observations.
>
> Two other facts must be borne in mind: First Fisher [Smithson Misc. Coll., 76, No 9; 1924] found winter eclipses to be brighter than those occurring at other seasons and second, exceptions to Danjon's Law have occurred when very dark eclipses were seen after the eruption of the volcanoes Krakatoa (1883) and Katmai Alaska (1913).
>
> But we must return to Link's final conclusions: That a scattering layer in the upper atmosphere, or luminescence of the lunar surface, both caused by solar corpuscular radiation, describe qualitatively the general features of Danjon's Law but are quantitatively completely unsatisfactory. so the cause of the relationship remains unknown.[17]

Let us now analyze Hughes' statements in that eminent journal, *Nature*. Firstly, the "exceptions". Everyone is aware of the tremendous explosion at

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Krakatoa and how it affected sunsets for years afterwards. The violence of the explosion was such that a tsunami struck the coast of South Africa thousands of miles away. There can be no doubt that this incredible explosion of nature caused enormous quantities of dust to be thrown into the Earth's atmosphere. Such dust would be scattered around the world by the various air currents, jet streams, etc. Since the light of the Inner Sun must pass through the outer Earth's atmosphere it is understandable that the light which the Inner Sun might throw on the Moon is reduced. There can also be no doubt that as with Venus, that the air from the Inner and Outer atmospheres are constantly mingling.

The other volcano, Katmai, in Alaska also brings no surprises. That it exists in Alaska, close to a possible polar entrance should again leave us with no surprises. Any dust in the air will easily affect light passing through the polar atmosphere.

As I mentioned above, I do not question the conclusion that dark eclipses of the Moon are due to dust in the Earth's atmosphere. Here the evidence stands firmly. But dust in the Earth's atmosphere will impede light from the Inner Sun as well—as long as there is an interchange of air between the Inner and Outer Earths.

However, bright eclipses (and the scientists are talking of anomalously bright eclipses) have no suitable explanation. The best anyone has come up with is Vassy's 1958 theory that aerosols in the atmosphere can account for the bright eclipses. Let me remind the Reader that scientists attribute the anomalously bright Venusian polar regions to aerosols in the atmosphere. But as with the problem under consideration here is that really the correct answer? Or is the Inner Sun of Venus lighting up those polar regions too?)

Link's extensive 1974 studies caused him to conclude that while aerosols could provide a valid mechanism, they could **not** account for the power of the light source involved. Thus both Hughes and Link find themselves without an appropriate light source which is lighting up the Moon.

Danjon's original analysis goes back to the time of Tycho Brahe. Danjon's Law is based on the analysis of several centuries worth of data and therefore has a very sound basis.

Danjon tried to tie his law back to solar radiation. This is understandable because as far as our scientists know there is only a one Sun in the solar system. What both Hughes and Link realize is that Danjon's Law points to a

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"solar cycle" of 10.87 years instead of 11.2. To the Reader this might not appear to be of much importance—but it is. 10.87 years will result in a vastly different set of results to a cycle of 11.2 years. Let me demonstrate this by way of the table below. Suppose that in Year 0, these two cycles are both at their maximum. As the years go by these cycles will gradually go out of step.

Cycle No.	Danjon Cycle	Solar Cycle	Years Diff.
0	0.00	0.0	0.00
1	10.87	11.2	0.33
2	21.74	22.4	0.66
3	32.61	33.6	0.99
4	43.48	44.8	1.32
5	54.35	56.0	1.65
10	108.70	112.0	3.30
15	163.05	168.0	4.95
19	206.53	212.8	6.27
20	217.40		4.60
32		358.4	(0.31)
33	358.71		

Note how such cycles will go out of step. By the fifth cycle, the difference between the "Danjon solar cycle" and the solar cycle will be 1.65 years This difference will continue to increase. By approximately the 20th Danjon cycle we find the Danjon cycle beginning to "lap" the solar cycle. At the 19th cycle the two cycles will be 6.27 years out of step—which means that the one cycle will be at a maximum when the other is at a minimum. This is as out of step as they can get. Then their times come closer in line as the Danjon cycle "laps" the solar cycle. The 33rd Danjon cycle is at its maximum 358.71 years later. The 32nd solar cycle occurs 358.4 years from when they originally were in step. At this point the two cycles will appear to be in step again. In truth it's the 33rd Danjon cycle which is "in step" with the 32nd

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solar cycle. What is the relevance of all this? These two cycles differ by approximately: 11.2 - 10.87 = 0.33 years. This means that within a mere 150 years they will be totally out of step.

Danjon had several centuries worth of data at his disposal. During that time there would unquestionably have been bright eclipses occurring at total variance with the solar cycle. Indeed within a mere 150 years you would be getting bright eclipses which were five years earlier or later than the current solar cycle.

Danjon deduced his own solar cycle from these bright eclipses. But which solar cycle did he really discover? Since Danjon was basing his data on Moon eclipse brightness he ended up with a cycle which was out of step with the true solar cycle. OR, did Danjon, unwittingly, discover the **Earth's Inner Sun cycle**?!

Danjon's data is sound. There can be no doubt about it. It's just that his data cannot possibly support the idea that the Sun is the source of the light which is lighting up the Moon. Danjon had discovered something else. So in the 1970s Link and Hughes realize that there is an unknown source of radiation which is lighting up the Moon.

I hope to be able to produce Hollow Planets II one day. There is similar point which I will raise there. Jupiter's Great Red Spot was discovered to have a brightness cycle of its own which amounted to 12 years. Again, scientists tried to correlate that with the Sun instead of realizing that something in the body of Jupiter is the cause of the brightness changes.

So as far as we know, the Sun has a solar cycle of 11.2 years while Earth's Inner Sun has a cycle derived from Danjon's Law which is 10.87 years. The Jovian Inner Sun has a cycle of 12 years. It is even more out of step than the Earth's Inner Sun is. The Jovian data is very fascinating, but beyond the scope of this book.

It should be obvious to the Reader that Danjon's Law goes totally out of step with the solar cycle and that bright eclipses only correlate with the true solar cycle 50% of the time. The other 50% of the time they are totally out of step. This means that there is a totally independent light source operating which can shine on the Moon.

Some photos of the Earth's aurora as seen from space give us some idea of its brightness. It also raises a fascinating question: **Why isn't the aurora brighter here on Earth—or is it perhaps that most of the radiation is actually pointed outwards and away from the Earth?**

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The aurora is said to be only made up of charged particles. But what of direct light? Could this be refracted out through the polar atmosphere to sometimes shine on the Moon? Or does the Moon have an effect on the Earth's magnetic field which causes charged particles to head towards it thereby transferring some of the Earth's charged particles towards the Moon where they shine? But how can they shine there? There is no atmosphere (or is there?)

The really key issue in the above analysis by Hughes is this sentence about Link:

> He finds that the phenomenon behind the law is not the absorption of the light in the terrestrial atmosphere as originally assumed by Danjon but some light source other than the normal refracted solar illumination. The problem is to find this source. Vassy [J. Sci. Met. 8, 1'1958]

This is the key to the whole problem. To solve the problem we need to find the missing light which is lighting up the surface of the Moon—and the only reasonable culprit is the Earth. The above sentence is critical, for it strongly suggests that the Earth itself is somehow, a source of light. In 1980, N. Sekiguchi wrote:

> Danjon's original analysis of historical data on eclipse brightness has been considered flawed by modern scientists. For example, he couldn't fit some of the dark eclipses following volcano eruptions into his scheme. Other studies have, in fact, found little if any connection between eclipse brightness and solar activity.[18]

This is one of those occasions where Hollow Planet theory really seems to come into its own. Here we have the testimony of another scientist that Danjon's Law is not related to the solar cycle. This is exactly what I pointed out a little earlier.

Here is what I think: Of course not all volcanoes would cause dark eclipses. It depends on where the dust is in the atmosphere. If the dust did not impede the light from an Inner Sun then it could easily be that the light from the (outer) Sun is being blocked out by the dust, but the light from the Inner Sun continues to shine unimpeded thereby giving the impression that there is no darkening of the Moon. Since there are two possible light sources which can light up the Moon—things can be quite tricky. Sekiguchi does not realize

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the importance of what he is saying. He is saying that the Moon does not always experience dark eclipses when it should be, and that is correct, because the dust might not yet have reached the Arctic regions and therefore the Inner Sun's light continues to light up the Moon. Sadly I know of no spectroscopic studies of the Moon's light under such circumstances.

I am in total agreement with the scientists who see no correlation between the solar cycle and Danjon's Law. Danjon's Law may represent a cycle of the Earth's Inner Sun, not the true solar cycle. But how could we expect Danjon to know that the Earth is itself a source of powerful radiation which can light up the Moon?

The Reader should appreciate that Sekiguchi's criticisms merely serve to strengthen my contention that Danjon's Law could only be caused by the Earth's Inner Sun. Danjon cannot be faulted for attributing it to the Sun—he didn't know any better.

Some scientists have noticed similar events on Jupiter, with regard to its Great Red spot and they too made the same conjecture as Danjon, with similarly flawed results. They tried to relate the variations in the brightness of the Great Red spot to the solar cycle. But that only held true for a part of the solar cycle, and then it went out of step with the solar cycle—exactly as Danjon's Law has done. In both cases (Great Red spot and Danjon's Law), scientists threw the idea away.

The eclipse of the Moon on 18 Oct 1967 was very bright. This eclipse occurred **three years after the solar minimum and was considered to have been far too bright to conform to Danjon's rule.** But that's only if you accept that Danjon's Law describes the true solar cycle—which I don't think it does. These eclipses which are considered to be contrary to Danjon's Law are simply thought to be so because the scientists are thinking in blinkered terms of the solar cycle. If you will consult the table I drew above you will see that the Danjon cycle and the solar cycle can be out by many years—up to about six years (depending on which cycle you're attempting to match). Having this bright eclipse three years after the solar minimum is perfectly in keeping with Danjon's Law—if it is caused by an independent light source. As long as this eclipse corresponds to the 10.87 year "Inner Sun cycle" then it will be quite satisfactory. All this proves is that bright eclipses of the Moon are **not dependent upon solar radiation—but on radiation from another source which is unknown.**

Again, let me drop another titbit from Hollow Planets II which is

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relevant. There is a mysterious brightening of the Jovian moon Io sometimes when Io has been behind Jupiter—in its shadow. Scientists have picked up that Io is sometimes anomalously bright when it comes out from behind Jupiter. Scientists have never thought of correlating this with a time when Io is above the Great Red Spot! I have wondered if some anomalous radiation from the Great Red spot is the cause of the mysterious brightening of Io?

The Earth's Moon is therefore not the only object in the solar system which undergoes such an effect. Io is the closest of the Galilean moons to Jupiter. On Saturn a bright spot appears on the ring systems. This extremely bright spot is the cause of many a Saturnian mystery. These three different phenomenon may all have a very similar origin—in that light emanates from inside planets.

Danjon's solar cycle does not match the true solar cycle because the radiation of the Inner Sun may vary of its own accord. The Inner Sun's magnetic field may be affected by the Sun's magnetic field, but that's a different matter. What we also do not know is how stable the Inner Sun is inside the Earth. Perhaps an Inner Sun is moving in some kind of orbit or has a minor wobbling motion.

Hughes' paper in *Nature* also mentioned that Fisher found winter eclipses were brighter than summer eclipses. By winter eclipses I assume they are speaking of winter in the northern hemisphere.

During the northern winter, the Arctic regions are in darkness. In order for them to be in darkness, they must be pointed away from the Sun. The Earth is tilted 23.5°. This is the cause of the seasons. In winter, the Arctic is tilted 23.5° in the direction of the night side. If bright eclipses of the Moon are correlated with the northern winter then it follows that the **only possible geographical area** on Earth which can account for this is: the Arctic. This suggests that inside the Arctic circle one may find a polar entrance into the Inner Earth from whence light is lighting up the Moon. Since the Arctic circle lies in almost total darkness through much of the winter it follows that the Polar Hole is probably somewhere north of the Arctic circle.

I did wonder if the Moon could be lit up by the aurora. There is some evidence to suggest that this is also partly the case. However, I know of no correlations of the bright eclipses with bright auroras to show that auroras are the only cause. Bright auroras do seem to be a part of the cause—but not totally. Even so, the Reader should not forget what Prof. Davis told me—that the light from the aurora is far too weak to affect the Moon. Now another

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possibility is that much of the light from the Earth might be directed upwards, away from the Earth. So there may be more to the aurora than we think. There may be other aspects to it which have not been studied.

Returning to Danjon's Law—this is something different. If the Moon's brightness varied according to the solar cycle then one could indeed blame the aurora. But since this cycle is totally independent of the solar cycle, it follows that we're not dealing with the aurora either.

It may become very complicated. For example, the aurora may be brighter than we think and much of its light might be directed away from the Earth. Added to this may be refracted light which also emanates from inside the Earth. Dust in the atmosphere may then be a further complication. Spectrographic analysis of the light from the Moon during all these times might help to identify the origins of the light which shines on it.

By studying eclipse specifics one might perhaps be able to deduce the location of the Polar Hole by noting the times when the Moon is anomalously bright and when it is not.

The winter correlation is extremely important. It definitely links a fixed geographical area on the Earth with bright eclipses of the Moon. It links an area which resides in partial and total darkness with a light which is falling on the Moon. It also allows us to deduce a new fact: Either the northern polar entrance is larger than the southern polar entrance or, perhaps the northern polar entrance is the more offset of the two, enabling it, and it alone to light up the Moon. Or perhaps the Earth only has one hole in its crust—and that hole may lie in the Arctic circle.

DIRECT LIGHT ON THE MOON?

Could an Inner Sun really shine direct light on to the Moon? One wouldn't expect that to be the case. However, there are many factors involved in this, and it's quite a complex issue. The following ingredients affect this issue:

1. The Moon's orbit takes it approximately 27° north and south of the equator.
2. The Earth is inclined by 23.5°.
3. The width of a possible polar entrance.
4. The position of the Inner Sun inside the Earth at the time. Perhaps an

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Inner Sun wobbles around inside the Earth?
5. The temperature of the atmosphere inside the Earth.
6. The refractivity of the Earth's atmosphere in the Arctic.

The most favorable conditions will therefore be when the Moon is 27° north of the equator, during the northern winter (when the Arctic is inclined towards the Full Moon).

There is one other scenario that does spring to mind, and that is New Moon, during the northern summer. The phenomenon of the "old Moon in the new Moon's arms" could perhaps be affected by light from the Inner Sun. However, I know of no studies of this phenomenon.

Light could never fall directly on the Moon's surface if it originates from inside the Earth, travelling out via the polar regions. The main factor which might make this possible is the refractivity of the atmosphere in the arctic. Since we do not know the temperature of the atmosphere inside the Earth, it is hard to say how the light would behave. But assuming it to be warmer than the polar regions, perhaps light could be refracted enough to fall on the Moon. Since the light from inside the Earth would be travelling a considerable distance through the inner atmosphere and then into the outer atmosphere, it is possible that considerable bending of light might just take place. I would suspect that if such an event would take place, it would probably be extremely rare. I do not think there is much chance of light from the Inner Sun falling directly on the Moon. I have only found one possible example of this occurring. I feel it is important to mention the vague possibility that light from the Inner Sun might light up the Moon either at Full Moon or at New Moon—for the simple reason that perhaps someone might one day be in a position to study these possibilities. Of course this might also be a dead-end street. I have found one fascinating eclipse which might satisfy the criteria I have mentioned above:

> Captain G. Brown was in charge of the S. S. Pacific Importer which was sailing from Cristobal to London. The following report was made by Mr. T. M. Sims, Third Officer, on during the night of 29–30 Jan 1953 (See Figure 9.2).

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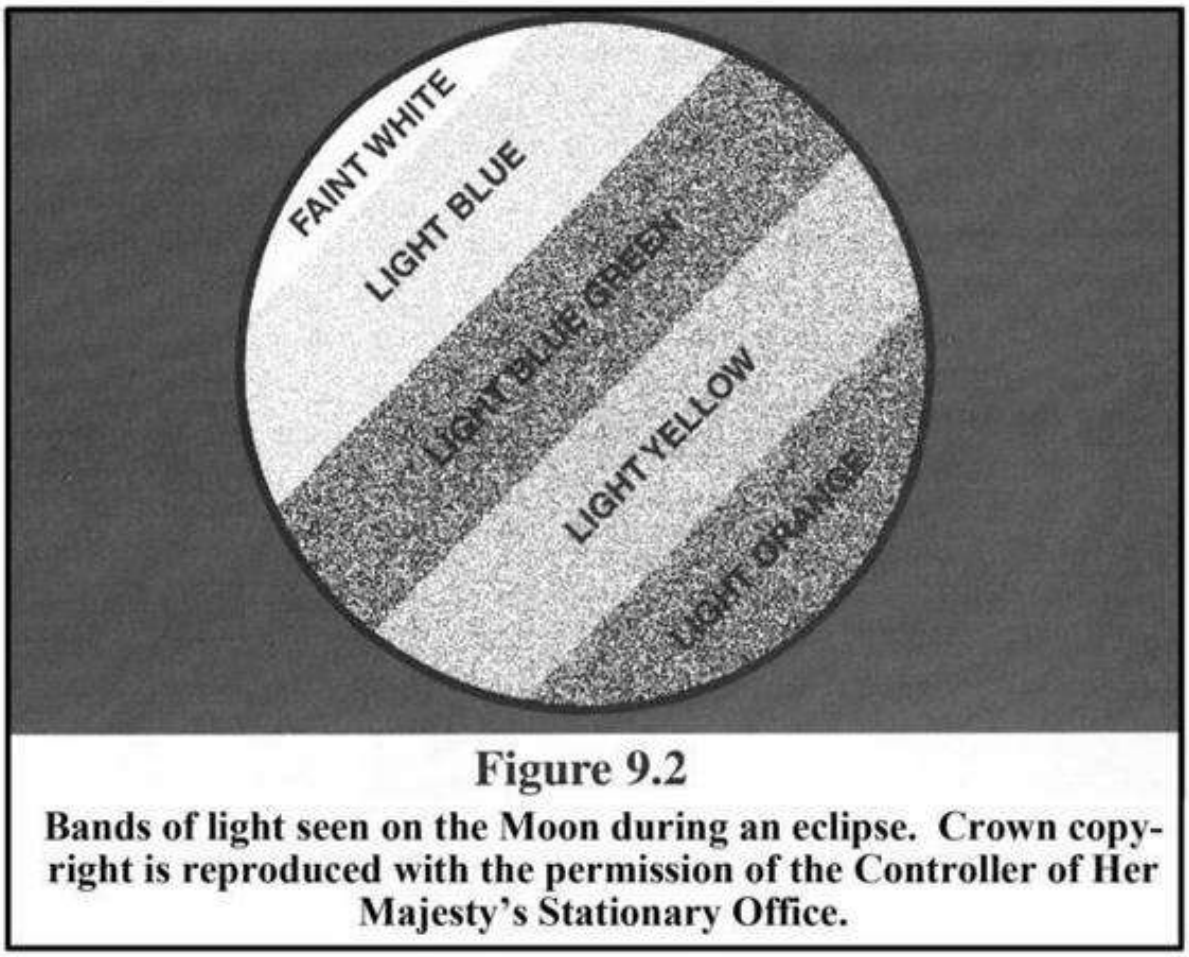

Figure 9.2

Bands of light seen on the Moon during an eclipse. Crown copyright is reproduced with the permission of the Controller of Her Majesty's Stationary Office.

From 2305 to 0140 GMT The eclipse was not observed owing to almost stationary Cu[mulus] covering the Moon. **During totality a small white patch of light of low brilliancy moved round the North Pole of the Moon until that phase came to an end at 0030. From that time the white patch increased in area until the end of the eclipse at 0140. During the total phase the face of the Moon appeared to be colored in bands of blue, green, yellow and orange as in the sketch, and stars were visible with the unaided eye within 2° or 3° of the Moon.**

Position of ship at 0000 on 30th: 33° 22' N, 45° 20' W.

Note: The interesting part of an observation of a total eclipse of the Moon is the degree of luminosity of the Moon during the total phase and its color. To an observer on the totally eclipsed Moon, completely immersed in the shadow of the Earth, the body of the Earth would be

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quite invisible, since the Sun is then behind it. The observer would, however, see a narrow luminous ring of reddish or orange color, probably brighter in some parts than others, this being the section of the Earth's atmosphere presented to him in profile and illuminated by the refraction of sunlight through the atmosphere. It is this light which gives the illumination of the Moon which we see during the total phase.

The amount of light so transmitted to the Moon and its precise color varies to some extent on the occasion of different eclipses according to the degree of cloudiness and other meteorological conditions in the section of the atmosphere presented to the Moon. The totally eclipsed Moon usually remains sufficiently bright for the dark markings on its surface to be visible with the unaided eye. The normal color is reddish, reddish-orange or coppery. On rare occasions in the past the totally eclipsed Moon has almost, or even completely, disappeared from view. These "black eclipses", as they are called, are due to the presence of fine dust in sufficient quantity in the Earth's atmosphere, due to great volcanic eruptions.

The bands of blue and green reported by S. S. Pacific Importer form a very unusual observation, as light of these colors would not normally be refracted by the Earth's atmosphere.

Observations of this eclipse have been received from 18 other ships, but some of these were of a partial eclipse only. The color cannot be properly judged in the partial phase owing to the proximity to the fully illuminated part. There are six of the total eclipse which give details of the color as follows:

• S. S. Empire Ken, Captain P. M. Burrell: 32° 20' N, 29° 30' E.

Light brown, uniform over Moon's surface except for a lighter arc in the northernmost part.

• M. V. Inverbank, Captain R. A. Lorains: 00° 39' S, 59° 37' E.

Bronze, tinged with bluish-white at the lower edge.

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• M. V. Kenilworth Castle, Captain T. H. Whatley: 24° 48’ S, 35° 10’ E.

Dark reddish-brown, with faint pale arc at the lower limb.

• S. S. Manistee, Captain R. W. Lundy, O.B.E., R.D., R.N.R.: 04° 05’ N, 02° 58’ W.

Dark orange.

• S. S. Planter, Captain A. Robertson: 23° 20’N, 48° 11’W.

Light orange-reddish, the Moon’s rim from N to SE being whiter.

• M. V. Waipawa, Captain A. E. Warren: 15° 50’N, 77° 20’W.

Dull orange.[19]

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What is particularly interesting about this account is that the light which is shining on the Moon appears to be refracted and split into the different components of white light. Furthermore, the light around the Moon’s North Pole seems to be direct light. This event, seen by observers on 6 different ships, suggests that a cone of pure white light was shining somewhere north of the Moon’s North Pole. Some of this light just barely managed to fall upon the Moon’s North Pole. The remaining colors falling on the rest of the Moon suggest that this is highly refracted light. Two additional points:

1. The fact that the light is falling on the Moon’s North Pole is entirely consistent with my conjecture that light from the Arctic might light up the Moon. The first point which that light would strike is indeed the Moon’s North Pole.
2. This eclipse took place in January, just after the northern winter’s mid-point. This too is entirely consistent with Danjon’s Law and the scenario I have painted above.

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The main factor which might affect the ability of the Inner Sun to light up the Moon is the refractivity of the polar atmosphere and the temperature and pressure differentials between the Inner and Outer atmospheres. These are largely unknowns and there is much room for error.

Let us suppose that the necessary refractivity exists for the Inner Sun to light up the Moon. This would then raise new issues. For example: How much of the Moon's brightness is due to the Sun, and how much is due to the Earth? Is the "old Moon in the new Moon's arms" totally due to reflection of light from the surface of the Earth—or is there an Inner Sun component which adds to this light from time to time?

What I am trying to point out is that there is a certain danger involved in assuming that the Moon's brightness is only due to the light from the Sun.

SUNSPOTS AND MAGNETIC REVERSALS

As mentioned earlier, J. Bloxham used historical records of the surface geomagnetic field from 1715 through 1980 to map the geomagnetic field at the surface of the Earth's core over the past 265 years.

The picture of the magnetic field at the core-mantle boundary provided by J. Bloxham and D. Gubbins has provided some tantalizing hints about how a magnetic field reversal "might" occur. The moving "patches" of reversed flux seen (through a mathematical algorithm) on the core surface can, in principle, lead to the decay of the geomagnetic field we perceive at the planet's surface. The reversed flux of patches simply oppose and cancel part of the normal dipole field. These patches are thought to be created by thermally driven fluid upwellings in the molten core. **In a theory proposed by D. Gubbins, the patches of reversed flux may sometimes increase in size and strength enough to completely cancel out the dipole field and then drive the externally perceived geomagnetic field into a reversed state. He likened the patches to sunspots, which are magnetic storms on the Sun that are associated with the reversal of the Sun's magnetic field every 11 years or so.**[20]

Gubbins of course assumed this to be produced by convection cells inside a molten Earth. But he notes the similarity to the behavior of our own Sun which undergoes magnetic field reversals every 11 years. The picture he thus obtains, when he maps these patches of flux, is something very similar to the "Sun spots" seen on the Sun—except that they lie inside the Earth. Does

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an Inner Sun have “Sun spots?” Why not. Plus, Gubbins also determines how these flux patches cancel each other out and they can then neutralise the dipole field. Gubbins thus finds a magnetic reversal mechanism at work inside the Earth which is very similar to that found inside the Sun.

It is possible for example, that Venus has an Inner Sun, except that its flux patches would currently be cancelling each other out—until sometime in the future when a new predominant pattern emerges. With regard to Mercury:

> The only definitely known atmospheric constituent is helium. The existence of this light gas in the atmosphere may be explained by **the beta-decay of uranium and thorium in the crust of Mercury**.[21]

Could it be that inside Mercury there is enough radioactive material to drive an Inner Sun there too? So when all is said and done, the possibility of central Suns existing inside the Inner Planets (Mercury, Venus and Earth), might not be as preposterous as one might at first think.

IN CLOSING

The Reader should remember that a bright light cannot be seen in space, unless it reflects off something (e.g. dust). The Sun’s bright light cannot be seen—except where it strikes planets, dust and comets. So a bright cone of light, or two bright cones of light shining out of the Earth or any other planet will remain totally undetected unless:

1. It happens to shine directly towards you (a most unlikely event considering the distances involved and the incredible speeds at which solar system objects travel).
2. It were to strike some object or dust.

I would like to remind the Reader of the Maedler phenomenon which occurred on Venus. In that scenario, two cones of highly refracted light were pointing towards the Sun. These cones of light emanated from the Venusian polar regions. I speculated that this light was visible because of a passing dust cloud. If the Reader will take a look at those diagrams again, it will be seen that the light was considerably refracted. The refractive powers of the Venusian atmosphere are probably greater than those of the Earth. Perhaps

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refracted light emanating from inside planets should not be ignored.

The Reader should by now begin appreciating the possibility that Inner Suns might well exist, not only in the Earth, but inside Venus and other planets too. Is the bright spot on Mercury somehow related to its Inner Sun? Are the bright Martian polar caps somehow related to its Inner Sun? Is there an Inner Sun which controls the brightness of Jupiter's Great Red spot? And does it sometimes light up Jupiter's moon Io when it passes near that spot?

I have often wondered how much other data has not even been recorded because it may simply have been too bizarre even for the astronomers and scientists concerned to even begin dealing with. Perhaps they thought they were victims of cruel optical illusions, when the Inner Suns of the Hollow Planets of the solar system were busy playing amazing tricks with powerful beams of light!

Danjon's Law, in my opinion, provides solid, irrefutable evidence that a mysterious light source from the Earth's Arctic regions is lighting up the Moon—and that light source has a different cycle to that of the Sun. It is not a case of light from the Sun being refracted across the Arctic and lighting up the Moon. This light source may be producing and / or accelerating charged particles which light up the Moon. On rare occasions this light source might even cast a direct beam of light on the Moon.

I hope scientists will indeed reconsider Danjon's Law.

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Chapter 10: The Aurora

In the polar regions explorers, scientists and the inhabitants are often treated to phenomenal displays of light darting across the sky. This is the Aurora Borealis. The aurora is one of nature's most beautiful and mysterious phenomenon.

Most people have been taught at school that the aurora is the result of charged particles expelled from the Sun. These particles, racing through space strike the Earth in the polar regions. Most of these particles are expelled by solar flares and various storms on the surface of the Sun. These charged particles, upon striking the Earth's atmosphere cause the aurora. Some people are aware that the Earth's aurora, and that of other planets (like Jupiter for example), appears as a ring-like structure when photographed from space.

This sums up what most people know about the aurora. With this state of knowledge, it would appear that the aurora is caused by these charged particles from the Sun interacting with the Earth's magnetic field. There are several complications and unknowns which cloud this simplistic picture.

From the ground the aurora appears something like a curtain hanging across the sky. From space however it looks like a large ring surrounding the polar regions. Take a look at Plate 4. This photograph is taken from high above the North Pole. The satellite image shows the bright sunlit portion of the Earth on the left. From this angle most of the Earth lies in darkness. The aurora can be seen clearly as diffuse ring surrounding the north polar regions. Note how most of the aurora lies in darkness beyond the reach of direct sunlight. The width of the ring varies. It can be extremely thin. As activity increased it becomes broader. In Plate 5 we see the aurora two hours later on the same day. On this image we can also see the outline of the continents on the image. Notice how the aurora has now changed. Parts of it are now much brighter while other parts are much dimmer. The very brightest portion in this image lies directly above Scandinavia and parts of Finland and Russia.

My main source of information for this chapter was Prof. Neil Davis who is a geophysicist at the University of Alaska in Fairbanks. I wanted in-depth information, and so I studied a book he had written in 1992. I also communicated extensively with him by e-mail to make sure I had a

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reasonable grasp of the technical issues pertaining to the aurora.

The technical issues surrounding the aurora are extremely complex. It is by no means a simple subject as one might have been led to believe. I will however attempt to give the Reader a reasonably technical insight into the problems without boring you too much!

Prof. Davis has spent much of his life studying the aurora in great detail in both hemispheres. *The Aurora Watcher's Handbook* (which is available from the University of Alaska) covers all aspects of the aurora and accurately represents the current state of scientific knowledge on the subject. The University of Alaska is uniquely situated to study the aurora. It lies in the auroral belt. So it is no accident that the geophysicists at the University of Alaska are the foremost experts in the world on this subject. And Davis is one of them. He also happens to be a very nice man, and gave generously of his time to communicate with me. I will therefore be quoting extensively from him on the subject. He has several firsts to his name in this field of research. Among them, the introduction of television to auroral research. He played a key role in using rockets for auroral research and in producing artificial auroras. His experiments with auroral conjugacy in Alaska and New Zealand have not been repeated by anyone else as far as I know. I feel confident in using Davis as my prime source of information on the subject.

The Sun "boils off" many charged particles. These charged particles race away outwards from the Sun. This is known as the solar wind. Because of their charge, these particles are affected by magnetic fields—such as that of the Earth. When they encounter the magnetic lines of force they may be diverted from their current path, depending on the strength of the magnetic field. If the particles have enough energy they may be able to penetrate the magnetic field to a certain extent. As they penetrate deeper into the Earth's extensive magnetosphere the magnetic lines of force become ever stronger. It may come as a surprise to many to learn that 98% of the charged particles from the Sun reaching the Earth are deflected by the Earth's magnetic field. They never reach the Earth's atmosphere. A powerful magnetic field therefore acts as a repellent.

Those which do finally reach the atmosphere cause the aurora when they collide with the different rarefied gases at different heights from about 400 km down to about 100 km. The various colors of the aurora are caused by the different gases which are excited by the incoming charged particles. Oxygen gives off both red and green light depending upon its level of excitation.

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The solar wind is made up of particles which travel away from the Sun at speeds of 300 to 1,000 km/sec. It takes them a few days to travel to the Earth. The solar wind carries with it an irregular magnetic field, which "glues" the particles together. At a distance of approximately 30,000 km (5 Earth diameters), the charged particles begin to interact with the Earth's magnetic field. The magnetic field tries to turn them away. Positively charged particles are turned eastwards while negatively charged particles are turned westwards.[1]

The solar wind deforms the Earth's geomagnetic field. It pushes it away from the Sun. The geomagnetic field, when seen from above, looks almost like a comet, with the Earth being the "head" of the comet. The tail extends far into the night side of the Earth, well beyond the orbit of the Moon.[2]

The charged particles which penetrate the outer magnetosphere (magnetic field) run into an ever stronger magnetic field. This magnetic field begins to steer them. A major fraction of them then head to the polar regions where they descend into the atmosphere and create the aurora. Those which penetrate even further are then taken under the total control of the Earth's magnetic field. They become trapped in "magnetic bottles." Once trapped in these magnetic bottles they may never escape. If they happen to lose their charge then they can escape. If they don't lose their charge they will end up oscillating between the Earth's polar regions, trapped in these magnetic bottles.[3]

The basic idea of a magnetic bottle can be seen in Figure 10.1. Charged particles are trapped between magnetic lines of force. These particles then oscillate from one mirror point to the next. The magnetic bottle is an important concept which we shall be examining later.

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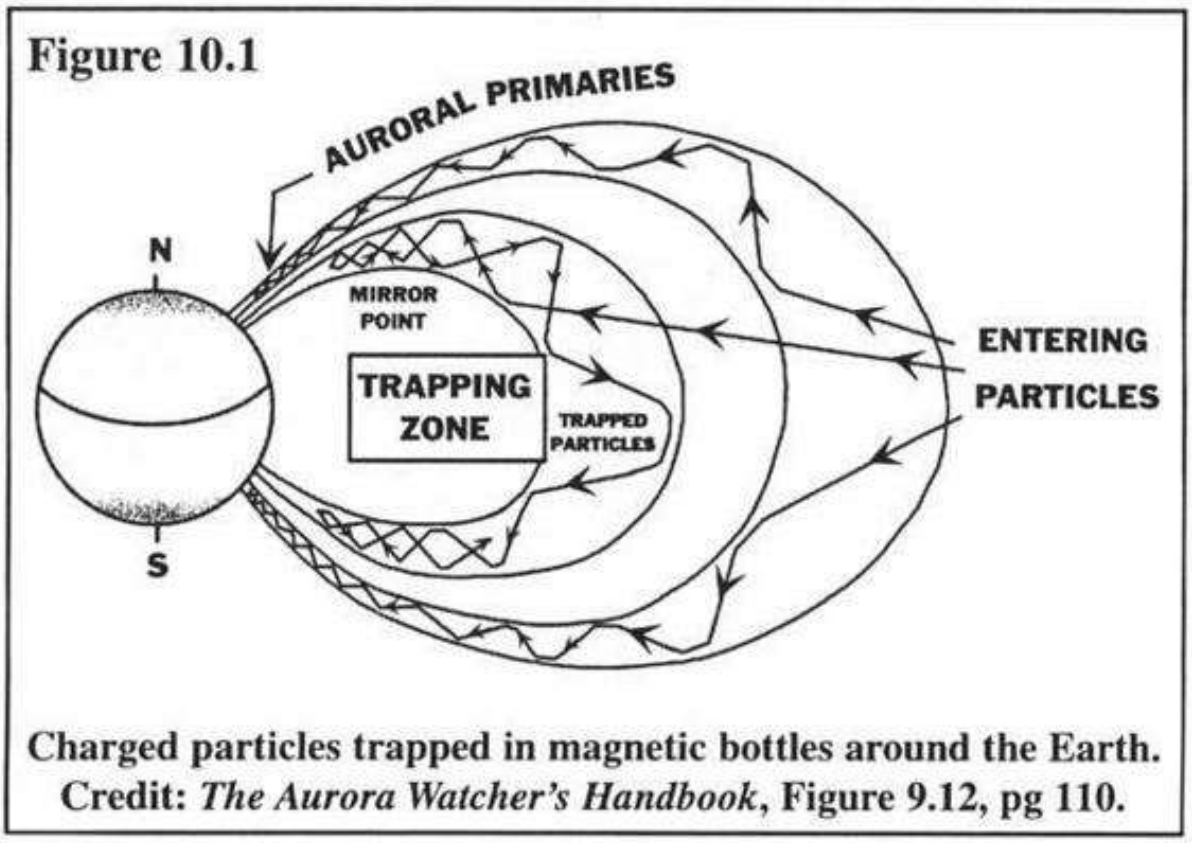

The ability of these particles to penetrate the magnetic field depends upon their energy. As Figure 10.2 shows, most (98%) of the charged particles are deflected by the magnetosphere.

So how do the charged particles get into the atmosphere to cause the aurora? Amazingly enough, many of them are thought to enter from behind the Earth—as shown in Figure 10.2.

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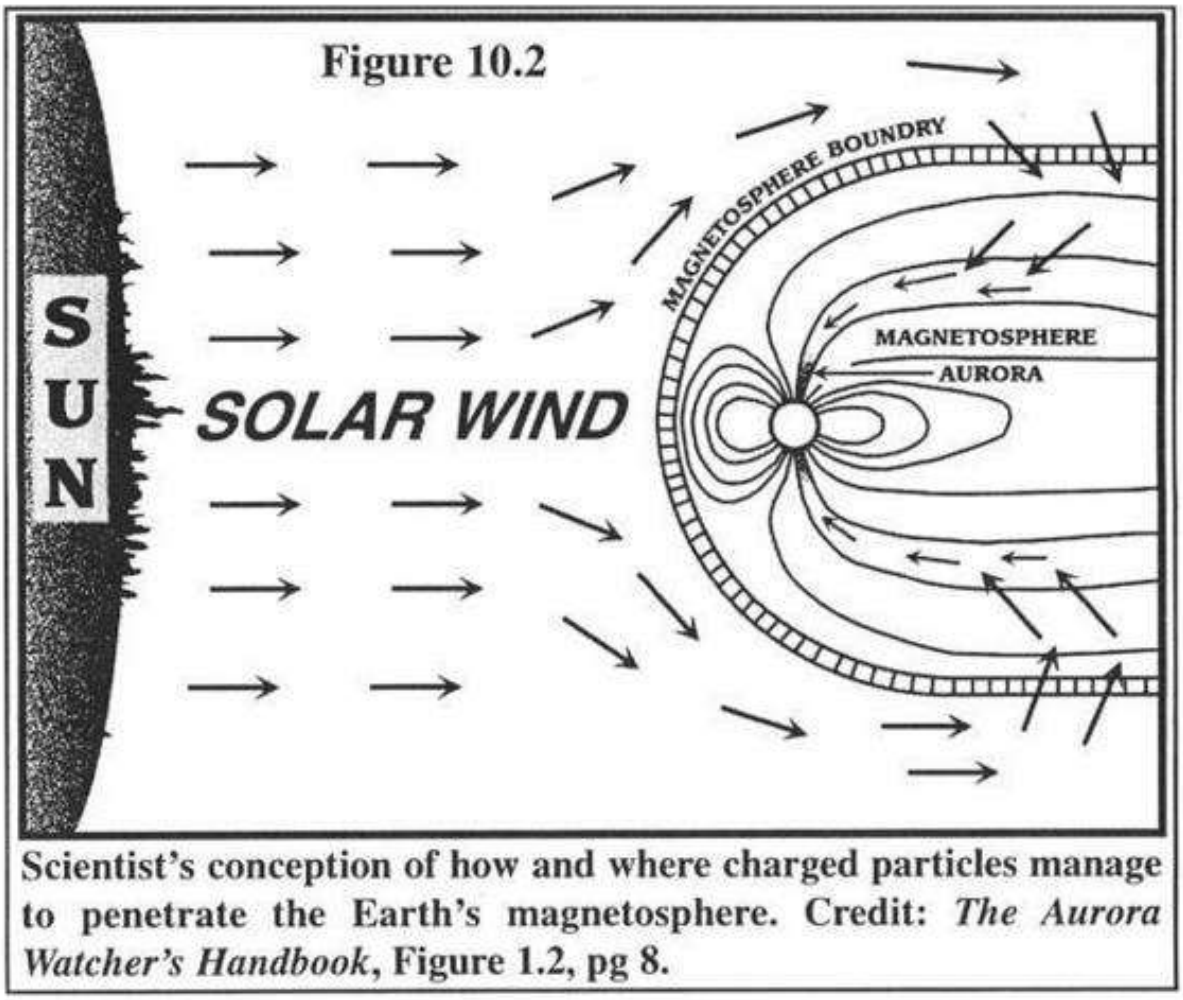

Scientist's conception of how and where charged particles manage to penetrate the Earth's magnetosphere. Credit: *The Aurora Watcher's Handbook*, Figure 1.2, pg 8.

The aurora is a relatively low-level phenomenon, occurring mostly at an altitude of 50–60 mi. According to scientists the aurora rarely comes closer to the Earth than 60 km. When an aurora appears to touch the horizon it is about 1,000 km away and at an altitude of approximately 100 km.[4] The aurora occurs more frequently in some areas than others. This can be plotted on a map.

AURORAL ZONE AND OVAL

The Auroral Zone is a belt which encircles the polar regions. This is the geographical area in which auroras occur. The aurora occurs more frequently in some places than in others. In Figure 10.3 we can see the various lines showing the number of days each year when the aurora can be seen in Alaska and Canada. The dark dotted line shows that the aurora here is seen

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approximately 100 days of each year. The northern auroral zone is approximately 23° of latitude in radius (1,600 mi).[5]

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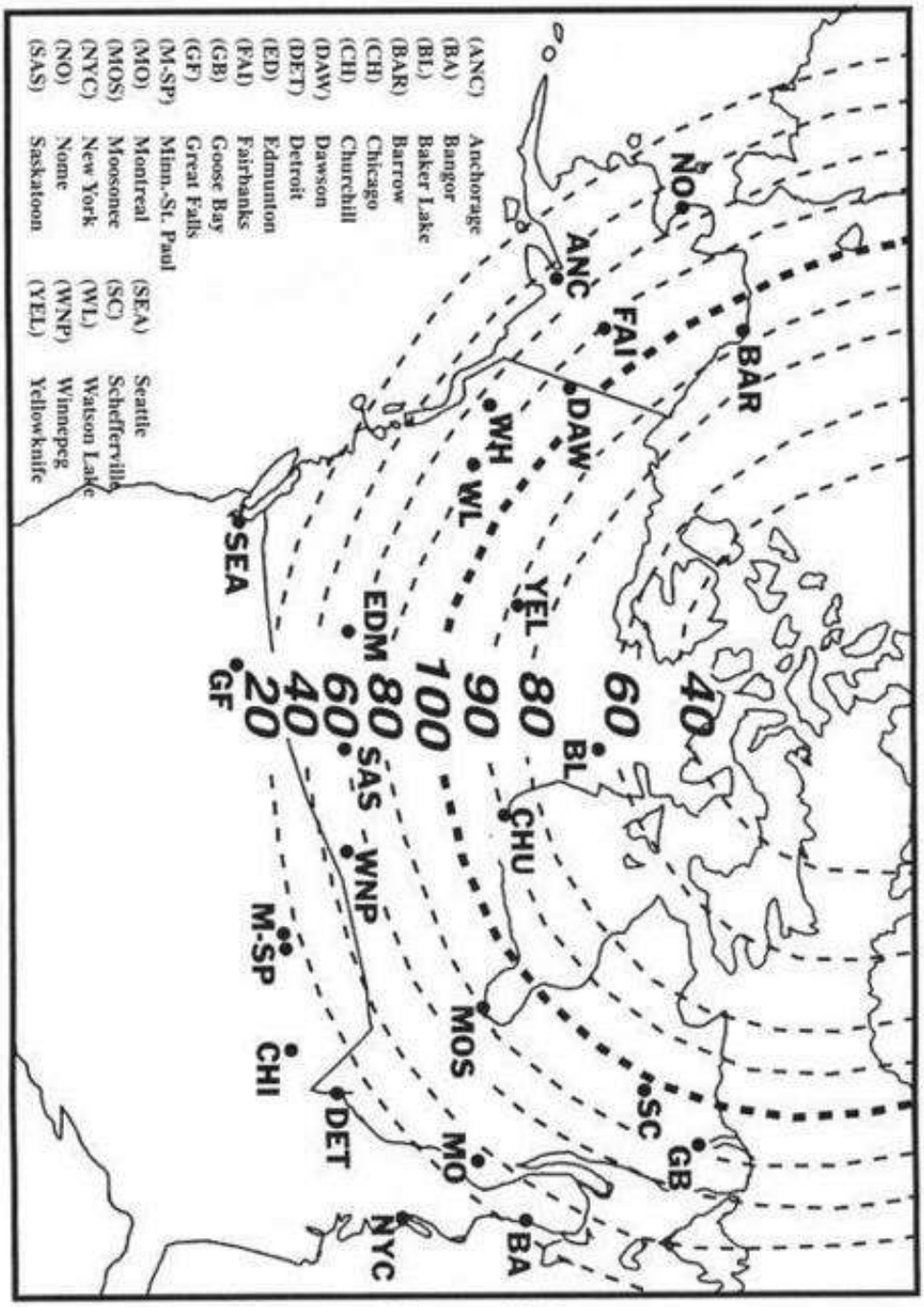

Figure 10.3

The long term percentage of dark, clear nights on which Aurora can be seen at locations in North America. The peak of the Auroral zone is the heavy dotted line labeled 100. Credit: *The Aurora Watcher's Handbook*, Fig 4.1, pg 24.

The auroral zone is a belt, at the center of which is a region where

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auroras occur more frequently than anywhere else. If one plots the region of maximum frequency then the result can be seen in Figure 10.4.

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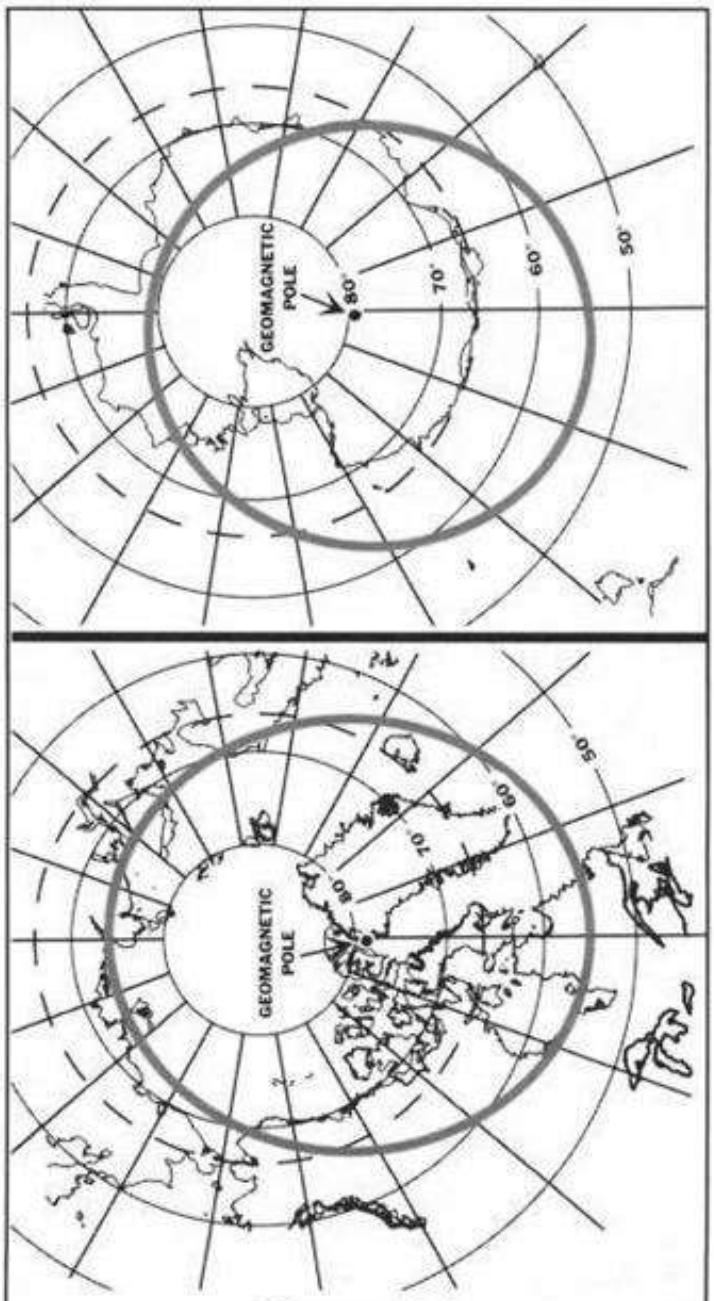

Figure 10.4

The peaks of the two Auroral Zones, centered about the northern geomagnetic pole near Thule, Greenland, and the southern one at Vostok, Antarctica. Credit: *The Aurora Watcher's Handbook*, Fig 4.2, pg 25.

The auroral zone is a statistical concept. It is merely the mapping of the

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frequency of the occurrences of the aurora in a particular place. However, the aurora, when seen from space does indeed appear as a ring encircling the polar regions. This ring, is known as the auroral oval. The auroral oval appears to be centered on the geomagnetic pole—i.e. at Thule, Greenland, in the northern hemisphere and at Vostok, Antarctica in the southern hemisphere.

When there is little auroral activity, the oval tends to be narrow and somewhat contracted towards the geomagnetic pole. However, when auroral activity increases, the oval widens and its diameter increases. The aurora, when seen from space can appear like a thin “curtain” of light which surrounds the poles. Indeed, one can liken it to a curtain in its appearance. The rays are more or less vertical, and they stretch in a very thin curtain around the entire arctic. At times of heightened activity, the curtain itself becomes much thicker. The diameter of this “curtain” increases, as it moves southwards in all directions.

The aurora may be likened to a thin curtain of light descending from high in the atmosphere. This curtain is produced by charged particles. This curtain appears to move and swirl. The “curtain” may sometimes have several parallel running curtains , each spaced evenly from the other, and behaving in unison.

As the Earth rotates, the auroral oval is itself skewed. The auroral “curtain” moves north and south during a 24 hour day. As can be seen in Figure 10.5, the auroral oval lies north of Alaska at midday. But at midnight it moves southwards. It’s thickness also varies.

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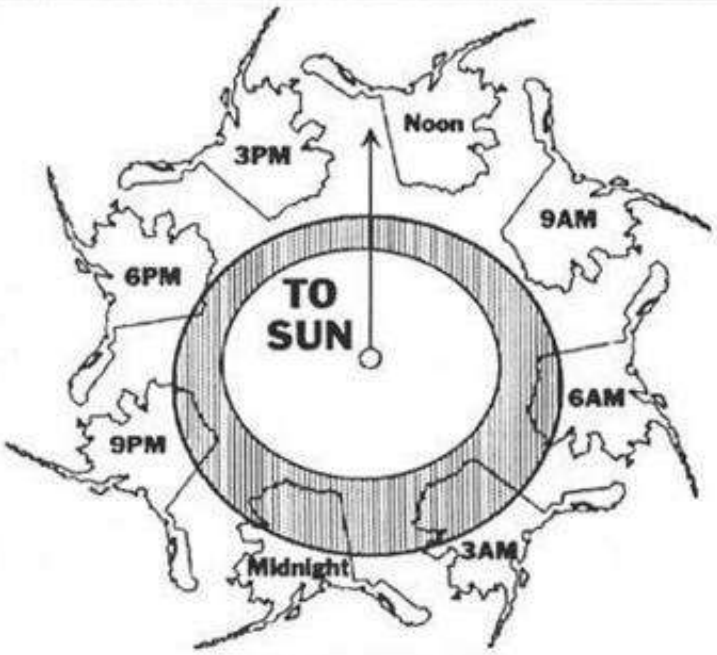

Figure 10.5

A statistical rendition of the Northern Auroral Oval. As the Earth rotates beneath, the Oval remains in a fixed orientation relative to the direction toward the Sun (arrow), and has off-center "attachment" to the Earth at the Geomagnetic Pole (encircled dot at the base of the arrow). Here, the changing positions of Alaska relative to the fixed Oval demonstrate how the Earth's rotation swings this and other parts of North America beneath the Oval only during the night hours. Credit: *The Aurora Watcher's Handbook*, Fig 4.3, pg 26.

The aurora used to mystify the early polar explorers. Sir Edmund Halley was the first to speculate that it might be caused by "luminous material"

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escaping from his Hollow Earth. This was seized upon by Hollow Earther's ever since and has become an integral part of the idea.

Marshall Gardner tried to demonstrate that the aurora was caused by rays of light shining out of the Hollow Earth. Gardner called into question the link between the aurora and solar flares and geomagnetism. In some ways Gardner has a valid point. The relationship between the aurora and solar flares is loosely statistical.

The auroral oval is skewed towards the night side of the Earth. The auroral oval's rim is also wider, brighter and more turbulent in the midnight sector. To an earthbound viewer the aurora can only been seen some time after sunset. The aurora becomes ever brighter as the evening progresses. At midnight the aurora is very active and undergoes the "breakup" phase. At this point the aurora is very active and at its most magnificent.

Gardner thought the aurora might be due to rays from a central Sun shining out of the Earth. However, we now know so much more about its exact behavior. Gardner 's idea, as well as Halley 's ideas, are definitely invalid. I was nevertheless fascinated by the possibility of a nuclear reaction within the Earth and so I spent several months familiarizing myself with the technical detail of the aurora. I wish to call the Reader's attention to something much more subtle—to a phenomenon known as the "pulsating aurora." Davis describes what happens during an auroral breakup:

> Within a few minutes the breakup will be over, and the sky takes on a seemingly uninteresting appearance. However, the observer who continues to watch should soon see pulsating auroras, weak by comparison with the preceding aurora, but nevertheless fascinating to watch. The pulsations are likely to continue, perhaps for the rest of the night.[6]

It this pulsating aurora which occurs all night long to which we shall be returning.

CHARGED PARTICLES FROM WHERE?

Scientists state that the charged particles which drive the aurora all come from the Sun. But is this really so? If the Sun is the only naturally occurring nuclear reaction which can affect the Earth, then indeed that may be so. But what if it is not?

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Firstly, the cause and effect between the Sun's output of charged particles, and the subsequent aurora, is extremely loose. Over a long period of time, there is without question a statistical link between the two. However, on a short-term basis this is not so. For example. The light emitted by the Sun takes 8 minutes to reach the Earth. Even though the charged particles from the Sun move at anything from 15 million to 52 million miles per day, there is no fixed link between solar flares and auroras. One would expect each solar outpouring to be accompanied by an aurora within 2 days or a week of that event. However this is not always the case. Sometimes, solar flares can occur for days or even weeks on end and there will be no resultant aurora.

As a general statement however, I have no problem with the concept that most of the charged particles do indeed originate from the Sun. Let us say, for the sake of argument, that 90% of the charged particles which drive the aurora probably emanate from the Sun. But as will be seen later, there are some, notably those which cause the pulsating aurora, which seem to hint strongly at a terrestrial origin.

But something else happens to these charged particles from the Sun during their transit. They are "stored" somewhere—for days, or weeks on end. These charged particles end up in these magnetic bottles. The Earth is encircled by the particles which lie in the Van Allen belts which surround the Earth.

Up until now, I have omitted a very important fact about the aurora. Davis writes:

> . . . these [charged] particles drift outward in the solar wind so slowly (1,000 times slower than the sunlight) that the journey takes several days. **Once the charged particles enter the magnetosphere**, **they undergo acceleration to speeds near one-fifth that of the speed of light. They then are capable of penetrating into the atmosphere to a depth of approximately 100 km above the Earth's surface**.[7]

This fact is of crucial importance. This fact is mainly known to scientists well-versed in the aurora. The charged particles which arrive here from the Sun have far too little energy to actually create the aurora. As Davis said, these particles are estimated to have a speed of between 300–1,000 km/sec. This is approximately 650,000–2,000,000 mi per hour. In order for these particles to be able to create the aurora, they must be accelerated to a speed of

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nearly a fifth that of light—or to something in the region of 1.3 x 10^7 mph. Some of the slower particles will be accelerated to 200 times their original speed. None of these particles which arrive from the Sun have that speed originally. So how are they accelerated? Scientists don't know either.

THE AURORA'S PULSE

Davis points to the striations seen in photographs of solar flares, and likens this to the striations seen in the "Auroral Curtain." Scientists have noticed the link between solar flares and auroras.

As the Reader should now begin to appreciate, the aurora is not just a simple cause-and-effect case of particles streaming away from the Sun and thereby triggering an immediate aurora on Earth. This cause-and-effect system does not work like clockwork, as most people imagine it does. The connection is much more loose. A solar flare on the Sun does not always trigger an aurora. The Sun might well feed some charged particles to the Earth, but the Earth, somehow, controls the aurora. Many mysteries abound which we shall visit.

Let us turn to the pulsating aurora. The pulsating aurora, might not be very bright or impressive, but it nevertheless represents quite a considerable amount of activity. According to Davis, in order for the human eye to see a single auroral flash in the sky, "The incoming flow of fast particles must amount to 100 million particles per second over each square centimeter of sky."[8]

The pulsating aurora is normally seen after the magnificent auroral breakup. It pulsates quietly in the night sky for hours on end. The pulsating auroral forms undergo periodic or semi-periodic variations in brightness. The periods range from 0.1 sec to more than 20 sec. Pulsating auroras are very weak and difficult to recognise. They normally appear to be colorless. Davis writes:

> . . . [Figure 10.6] contains tracings that show the temporal variations within pulsating auroras. **Note in the fourth panel the regular nature of the variation as compared to that in other panels**, **where the brightness changes are more irregular and burst-like. The variety of brightness alterations in pulsating aurora is endless**.

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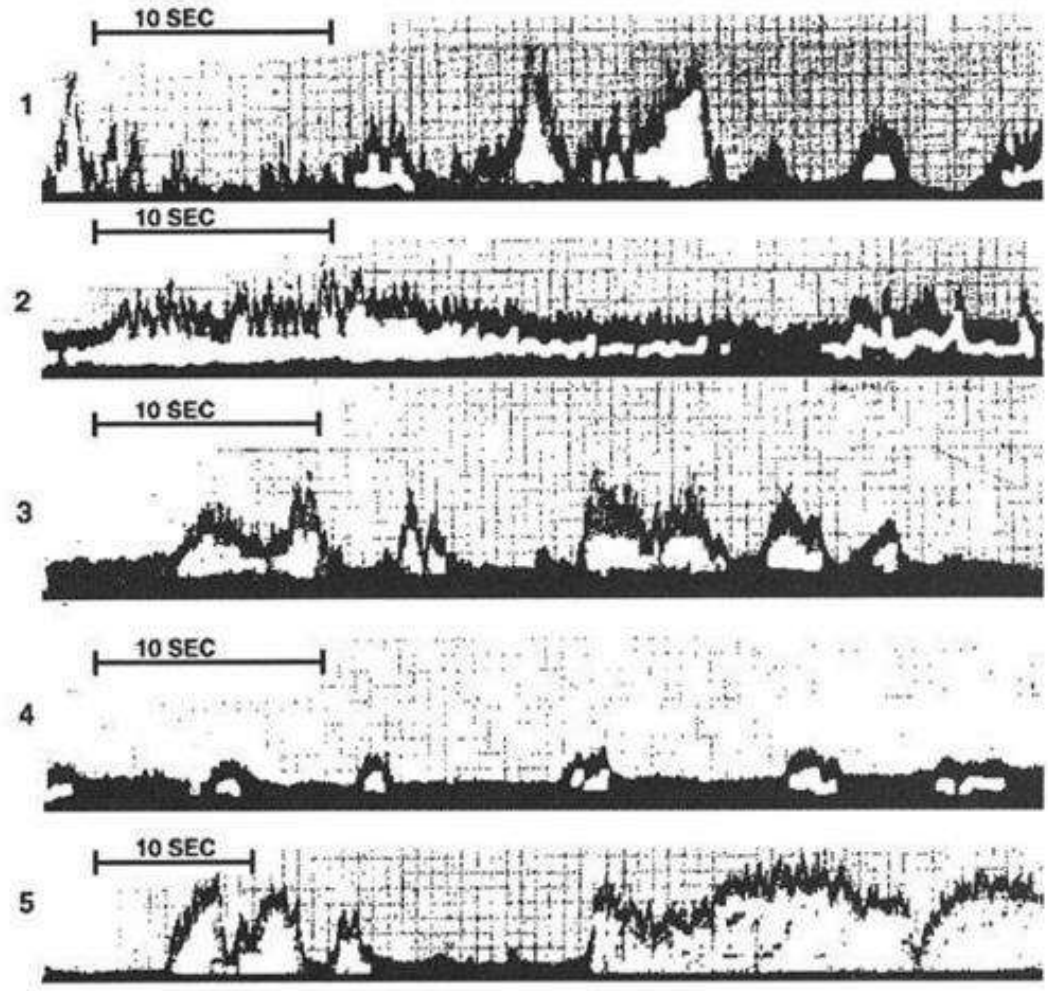

Figure 10.6

Credit: *The Aurora Watcher's Handbook*, Fig 5.10, pg 55.

Pulsating aurora is spectacular, but it lacks the brightness, color and fast motions typical of the discrete aurora. In the overall scheme of things, pulsating aurora is important because it is widespread and therefore represents the end effect of a substantial portion of the energy carried into the global auroral atmosphere by incoming fast particles. **Some observations suggest that the 'on' phase of a pulse is associated with an increase in energy of the responsible incoming particles because the altitude of the lower border during the 'on' phase is lower than the altitude of nearby diffuse nonpulsating background aurora that may accompany the pulsating forms.[9]**

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The pulsating aurora occurs normally in the morning sector and often continues until dawn. These strange pulsations continue for hours on end. Sometimes the pulse is very exact, as depicted in chart 4 of Figure 10.6.

Even other more intense types of aurora, also exhibit some type of "vibrations" or "flickering", to use Prof. Davis's own words: ". . . in the fashion of a candle's flame exposed to a gentle draft."[10]

Inherent in much of the aurora, is this distinctive pulsation, this variation in its strength. Since these discrete auroras are caused by incoming streams of electrons, the implication is that something is in control of the incoming streams of electrons? What could be pumping these electrons into the polar skies—sometimes with a burst-like structure?

Another strange feature of the polar skies is the "Black aurora." It is not really an aurora, but regions of the sky which possess an excess positive electrical charge (whereas auroral rays are normally negatively charged.) Professor Davis mentions that the black aurora is unexplained.[11]

The Reader should note that in all the examples given above, that this flickering, pulsating and flaming is taking place in the midnight sector of the Earth, where the Sun has no effect at all.

Auroras are more intensive during the high's of the eleven year solar cycle. This shows that most of the charged particles causing the aurora originate from the Sun and are then captured in the Earth's magnetosphere in magnetic bottles. How the particles are accelerated within the Earth's magnetosphere, and what causes the actual pulsations remains unknown to us. Prof. Davis writes:

> . . . the person who watches the aurora for any length of time is likely to get the impression that the brightness of auroras and the general level of activity vary, perhaps in irregular fashion, over periods of several minutes. **The reason for this variation is not known**.[12]

DUE SOUTH

As I have mentioned before, the aurora is not simply the direct and inevitable consequence of charged particles arriving from the Sun. There is another precondition for auroras which may strike the Reader as strange and unexpected—the Sun's magnetic field must point south. Consider this sentence written by Davis:

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. . . but scientists believe that most particles and energy cross the magnetosphere boundary through the tail of the magnetosphere. A critical factor affecting the entry is the direction of the weak solar magnetic field carried within the solar wind. Some scientists believe that the direction possessed by the solar magnetic field when it arrives near the magnetosphere is determined by the direction the field had when it left the visible surface of the Sun. Whatever that direction may be, and whatever its cause, the directionality usually persists for several days at a time. If the direction is generally southerly rather than generally northerly, then the situation portrayed in figure 10.7 can pertain.[13]

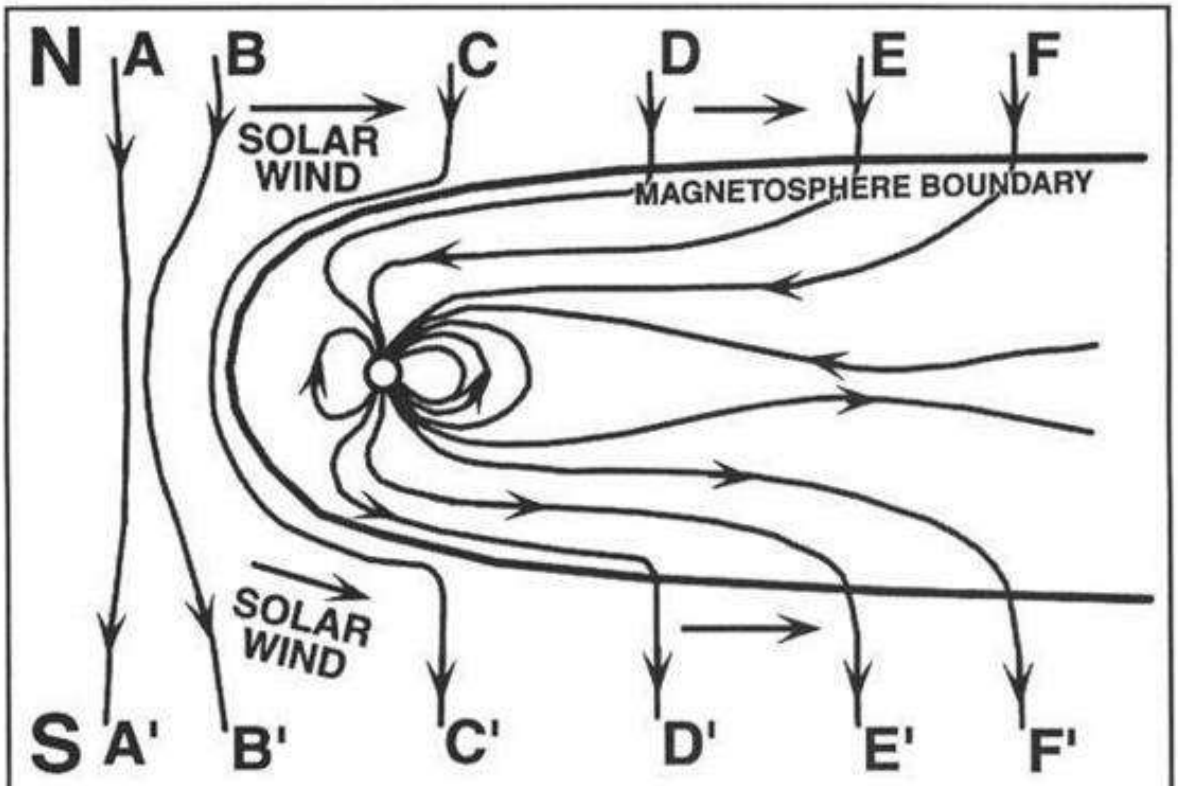

Figure 10.7

If pointed north to south, solar magnetic field lines carried in the solar wind can connect across the boundary of the magnetosphere to those inside, providing paths for incoming particles. As they sweep past the Earth, the field lines successively occupy positions listed in the sketch diagram as AA' to FF'. Credit: *The Aurora Watcher's Handbook*, page 112.

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In Figure 10.7 we can see lines marked: AA', BB', CC', etc. It seems that the charged particles enter the magnetosphere more easily: (a) From above the north polar regions (b) From behind the Earth. Prof. Davis explains:

> . . . the largest magnetic storms and the greatest auroral displays occur only when the solar magnetic field points nearly directly south—and also when the solar wind is moving most rapidly, and when the strength of the solar magnetic field at the magnetosphere boundary is at its strongest. Major auroral displays and major magnetic storms apparently never occur unless the solar magnetic field at the magnetospheric boundary is pointed primarily south.[14]

It is strange that the Sun's magnetic field must point in a north-south direction before the particles can enter the Earth's magnetic field. Could it be that the Earth's magnetic field is "weakest" at a point in line with a possible Polar Hole in the Earth's crust?

Consider this mystery: The scientists are not quite sure where the charged particles are entering the magnetosphere, because it repels the charged particles, 98% of them. There has to be some weakness in the magnetosphere which allows the particles to enter. Could it be that this is related to a possible hole in the crust of the planet? They surmise that the particles are entering from behind the Earth. But what if there is a "hole" in the magnetosphere? A "hole" which is a direct consequence of a hole in the crust of the planet? Could this be why the particles must be moving southward before they can then penetrate the magnetosphere and then cause the aurora?

The Earth's magnetic field is an excellent charged particle repellent. This might explain why there can be solar flares which do not produce aurorae. Only those which occur when the magnetic field is pointing southwards seem to produce aurorae. Scientists themselves are convinced that this is a prerequisite for the production of the aurora. But could the reason be different to what they think? Could it be that there is a feature in the magnetosphere which they don't know about?

So the charged particles have entered the magnetosphere. What then? The following sentence, penned by Davis is very telling:

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> What happens there is not known, but one view is that the kinetic energy carried by the particles becomes temporarily stored as magnetic energy which then releases suddenly during substorms and causes the acceleration of auroral primaries.[15]

It is clear from the above that some uncertainty exists regarding the sequence of events once these charged particles enter the Earth's magnetic field. How are they "stored?" How are they accelerated? Davis admits:

> . . . as the particles stream through the magnetosphere they somehow get speeded up (accelerated) before arriving at the Van Allen belt or the polar atmospheres.[16]

The auroral mysteries deepen.

AURORAL CONJUGACY

Back in 1733, the French scientist, Jean Jacques d'Ortous de Mairan thought that auroras might occur in the southern hemisphere as well. He expected them to be similar to those observed in the northern hemisphere. He suspected that the aurora was caused by the Sun, and he therefore expected the aurora to be identical in both hemispheres. From 1770 onwards, Captain Cook and other explorers in the southern hemisphere provided the first verification of this idea.

The term "auroral conjugacy" is even more specific. It means that the aurora in one hemisphere is a mirror image of the aurora in the other hemisphere. In geomagnetic terms conjugacy refers to points on a given magnetic line. Davis took part in a set of experiments which as far as I know have never again been repeated. They devised a computer algorithm to determine the exact conjugate point for a magnetic line of force originating from Fairbanks, Alaska. They determined this point to lie in the Pacific Ocean about 1500 km south of Christchurch and 600 km east of Macquarie Island.[17]

To test their ideas they conducted eighteen paired flights between 1967 and 1971. They made use of long-range military versions of the Boeing 707. These aircraft were equipped with various cameras and sensitive auroral television cameras. One aircraft would take off from Anchorage, Alaska while the other would take from Christchurch, New Zealand. These two

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aircraft then flew along carefully prescribed paths which allowed them to reach the calculated geomagnetic conjugate points simultaneously. Their routes took them towards the poles and back to their launching sites.[18]

They discovered that auroral displays in the different hemispheres were almost mirror images of each other. This was especially true at the equatorward boundaries of the aurora.[19] They also discovered that auroras in the northern hemisphere tended to be brighter than those in the southern hemisphere. There were some instances of exact conjugates occurring, but there were also instance where the conjugacy failed all together. It is interesting that conjugacy tended to fail at the higher latitudes.

The original idea regarding conjugacy related to the idea that charged particles from the Sun were striking the Earth's polar regions simultaneously. Since the Sun is almost 100 times the diameter of the Earth, one would expect the particles from a solar flare to engulf the Earth and for the aurora to be almost identical at all times.

However, as the Reader now understands, this is not the case. The particles which strike the Earth are possibly coming from "above" (the North or South Poles), and possibly from behind the Earth. The brightest aurora is on the night side of the Earth, away from the direct line of sight of the Sun. Also, the particles are travelling too slowly when they reach the Earth. Something is accelerating them. And yet, in spite of all this manipulation of these particles from the Sun, they retain some form of conjugacy. But they do more than that. Is something inside the Earth controlling the aurora's behavior? Davis discovered:

> The use of television systems on the aircraft led to one rather startling result. The systems detected pulsating auroras that were exactly synchronous; that is, the pulsating forms varied in brightness at exactly the same times in the two hemispheres within a tiny fraction of a second. (see Figure 10.8)[20]

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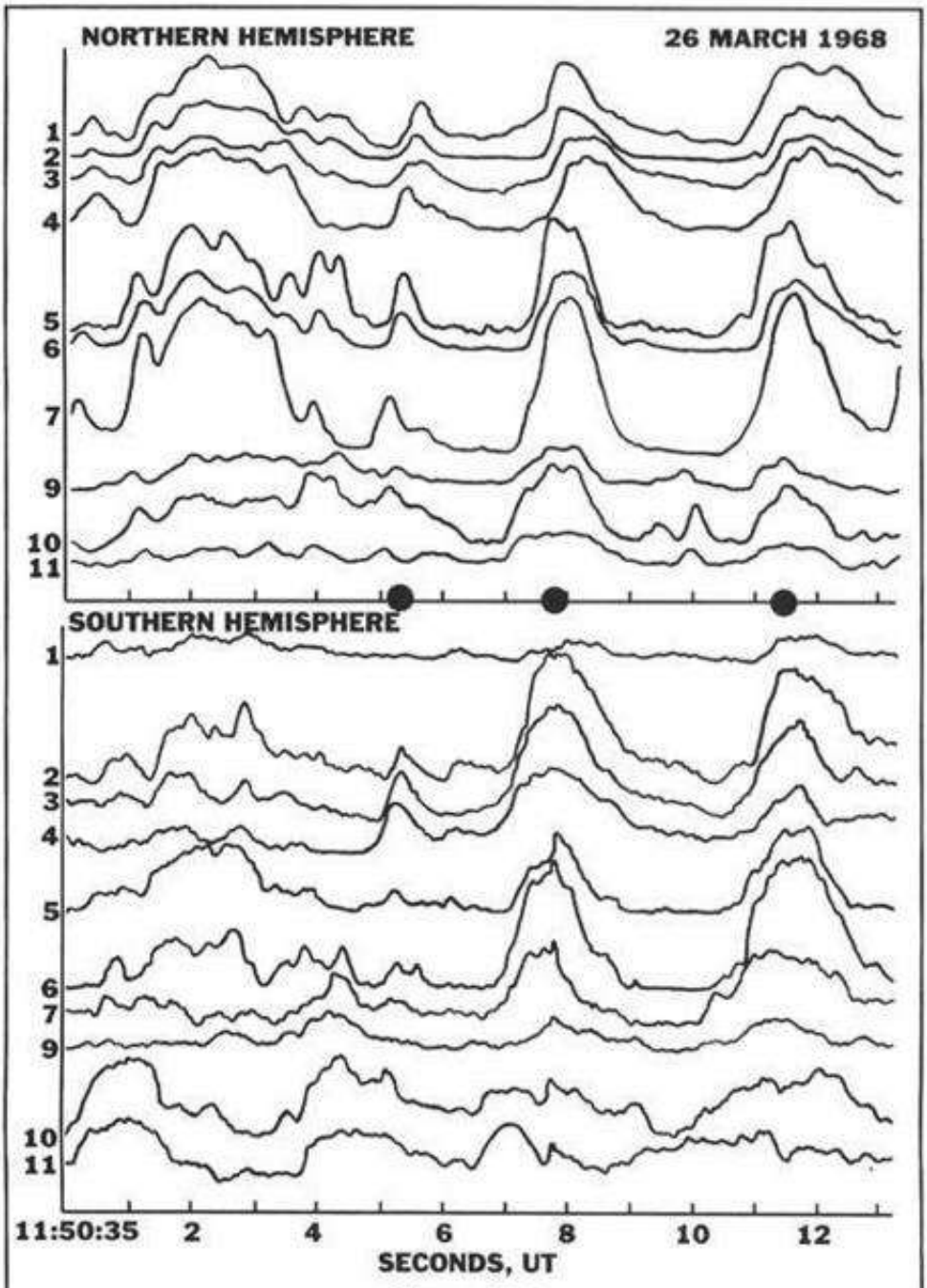

Figure 10.8

Photometer tracings of television recordings of pulsating aurora which shows exactly sychronous pulsations in the two hemispheres. (Each tracing line represents a particular portion of the television image.) Note the prominent sychronous pulses at right, marked by black circles at center. Credit: *The Aurora Watcher's Handbook*, page 123.

I previously pointed to the quiet, pulsating aurora which occurs after the

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auroral breakup The pulsating aurora hints at a constant and variable stream of incoming electrons coming from the night side of the Earth. What stunned Davis and the other scientists was the steadiness of these pulses. As Figure 10.8 shows, these pulses (hemispheres apart), have a sub-second synchronicity which is incredible.

They match each other in intensity and to within a fraction of a second. What makes this even more remarkable is the fact that the pulsating aurora is quasi-periodic—in other words, the pulsations have a strong random element in them. That these semi-random pulsations in both hemispheres should match each other to within a fraction of a second points to a common cause. It could never happen by accident.

The scientists fell back on the only possible explanation open to them. They postulated that bundles of charged particles were moving along the same magnetic lines and that they were bouncing back and forth in the same magnetic bottle between the hemispheres.[21]

Let us examine this explanation in the light of our knowledge of auroral theory. These scientists are proposing that a group of charged particles are bouncing back and forth along a magnetic bottle, and that through some unknown means, both ends of this bottle opened at that same time, allowing some particles to discharge themselves in one hemisphere, while the remainder bounced back to the other hemisphere to be discharged into the atmosphere there!

Firstly, it requires that the closed ends of a magnetic bottle be opened simultaneously at opposing ends of the Earth. Secondly, if a magnetic bottle opens, surely the entire group of charged particles (travelling as a bunch), should escape through the one open end? Why would only some be discharged and not the others? Thirdly, the quantity of particles escaping (hemispheres apart), must match each other in quantity (i.e. intensity). Take Figure 10.8 for example. The pulsations, great and small, match each other in intensity tens of thousands of miles apart from each other.

Remember too, that the pulsating aurora continues for hours and hours, and that these streams of electrons increase and decrease in intensity for hours on end, across large parts of the sky. Most amazing of all, in spite of this variability, these pulsations match each other exactly at opposite ends of the Earth. And where are these variable amounts of charged particles coming from? Are they all “stored” from the Sun?

The explanation that two ends of a magnetic bottle open up

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simultaneously, allowing only some electrons to escape, seems highly improbable to me. It calls for a system of micro-management of the geomagnetic field at both ends of the Earth simultaneously. By what means could this occur if the Earth were solid?

But what if these electrons originated from inside the Earth? What if an Inner Sun produced a variable stream of electrons? And what if an Inner Sun pulsated in some way? These streams of electrons might exit the Polar Holes, follow the magnetic lines of force and cause an aurora in the opposite hemisphere. An electron stream originating from Antarctica would therefore cause an aurora in Alaska for example. These quasi-periodic, semi-random pulsations might then match in both hemispheres simply because they come from the same source! They might also match each other in intensity—more or less. Travelling at tremendous speed, they would strike the atmosphere in two hemispheres almost virtually simultaneously.

The fact that they strike both hemispheres simultaneously may demonstrate that the distance from the source to both these regions is almost exactly the same—and a position at the center of the Earth is consistent with this.

Remember that the charged particles travelling in the Earth's magnetic field are moving at a finite and measurable speed. It takes several seconds for them to travel a few thousand miles. This might seem like a high speed, but as can be seen in Figure 10.8 we are dealing with sub-second synchronicity. The idea proposed by these scientists would most likely result in out-of-phase pulsations, than in pulsations of sub-second synchronicity. For example, a "bundle" of particles might be travelling together. Some might escape from the magnetic bottle in the northern hemisphere while the others mirror and travel back to the southern hemisphere. Some might then escape in the southern hemisphere. Thus one should find one pulse in the northern hemisphere, and a few seconds later another pulse at its conjugate area in the southern hemisphere. The scientists realized this, and went looking for out-of-phase pulsations. Prof. Davis admits:

> **However**, **the conjugate auroral flights revealed no examples of exactly out-of-phase pulsations (that is**, **alternating in the two hemispheres)**, **so the observations strongly suggest that some other mechanism is required to produce the pulsating aurora**. The fact that simultaneity can occur suggests an operative mechanism located **in the**

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> **equatorial plane**. . . That is one of the uncertainties; scientists still do not understand the relative importance of near-ionospheric and equatorial region magnetospheric processes in producing the aurora.[22]

I asked Prof. Davis to confirm whether they had ever found any out-of-phase pulsations. His reply to me on 30 Aug 1997 was as follows:

> Yes, I think this is very interesting. The crews of the airplanes we used for this work claimed that their timing was correct right down to a few milliseconds at worst, and I believe them. When we were able to detect corresponding pulsating auroras in the two hemispheres they **were always exactly in phase**, **right down to a few milliseconds.** (The travel time of particles having the energies involved from hemisphere to hemisphere is of order 1 second or more). **No we never saw any that were shifted at all. We really expected to find them bouncing out of phase just like a tennis ball going across the net and being hit back by racquets on either court**, **but that definitely was not the way it was.** You can believe Figure 10.5 (Reproduced as Figure 10.8) and the related discussion. That is not to say that what we observed relates to all pulsating auroras—but we never saw any examples counter to what is described. Bloody amazing, eh! **Whatever the cause it would seem that the triggering of the pulses must occur in the equatorial plane**.

Thus Prof. Davis confirmed that although they had expected to find out-of-phase particles going back and forth, thereby causing the pulsating aurora they never found any. As you can see, he found it pretty amazing. And it is his emphasis in the quoted passage, where he states that the pulsations were exactly in phase down to a few milliseconds out of a total travel time of more than 1 second.

Thus Prof. Davis concludes that the only place, half-way between the poles, which could control the pulsating aurora must therefore be something which lies in the equatorial plane! But there’s a problem in postulating the equator as the source of the pulsating aurora. The magnetic field at the equator is approximately half as strong as in the polar regions—the magnetic field is at maximum strength in the polar regions and is controlled from there. There is no known mechanism at the equator which has any effect on the magnetic field. Remember too, that the pulsating aurora occurs at night, and

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therefore the Sun cannot be the direct cause of these pulsations.

But, at approximately the latitude of the equator, inside the Earth, there may exist an Inner Sun. What if this Inner Sun's pulsations are the cause of not only the pulsating aurora, which lasts all night long, but also the exact synchronicity of the pulsations?

As Davis and others were to discover, through rocket experiments, charged particles take a few seconds to travel along the magnetic lines of force (they travel in a spiral motion). This is why Davis postulates the equator as the source of these pulsations, because he knows these particles travel at a measurable speed and hence if they were bouncing back and forth he'd be able to measure it easily. Since they arrive at the poles within a fraction of a second of each other, they must therefore originate from a point equidistant from the poles. The are two possibilities of course:

1. A point on the equator, outside the Earth
2. A point on the equator, inside the Earth.

When I communicated with Prof. Davis by e-mail about this exact synchronicity he was very excited about it. He thought it was a marvelous little mystery. His only conclusion remains that the cause must lie at the equatorial plane. But he has no suggestions as to what it might be. An Inner Sun perhaps?

FLASH AURORAS

"Flash auroras" are short-lived auroral displays which last only for a few seconds. This phenomenon has been reported by experienced auroral observers. T. Lohvinenko saw a rayed arc for a few seconds in a clear sky at 0644 UT in June 1987, in Winnipeg, Canada. A. Simmons observed rays and a luminous patch for two minutes at an altitude of 45° while looking south in February 1991, near Glasgow, Scotland. In both of the above instances, auroral and geomagnetic activity was at a global low.

R. J. Livesey writes: "It is unprofitable at this stage to speculate on the cause or causes of the mid-latitude flash aurora as it is known in the Aurora section. More authenticated observations need to be built up before they can become statistically meaningful."[23]

I wonder if there is a relationship between the flash aurora and the

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pulsating aurora? It is especially significant that this occurs at a time when the Earth is not being flooded with charged particles from the Sun. Hence, it suggests to me that this aurora is produced by something here on Earth which is generating charged particles. An auroral flash might therefore be nothing more than some magnetic lines of force being bent abnormally and thereby discharging their “load” of charged particles in the Earth’s atmosphere.

THE INNER SUN AND THE AURORA

After having familiarized myself with the technical issues pertaining to the aurora, it seems to me that there are several key unexplained issues:

1. Where/How do charged particles from the Sun enter the magnetosphere?
2. Why are the brightest auroral displays related to a south-pointing solar magnetic field?
3. What mechanism at the equator is capable of accelerating them to almost 200 times their original speed?
4. Where does the steady, but short bursts of electrons come from which cause the pulsating aurora all night long?
5. Why are these pulsations exactly synchronous?
6. Why do some of these pulsations overlay some of the stronger auroral activity too?
7. It seems to me as if the flash aurora might be related to the pulsating aurora, and may be caused by the same mechanism.

I have said before that the aurora moves southwards and the oval widens during heightened activity. The aurora can “jump” in several such steps during increased activity.

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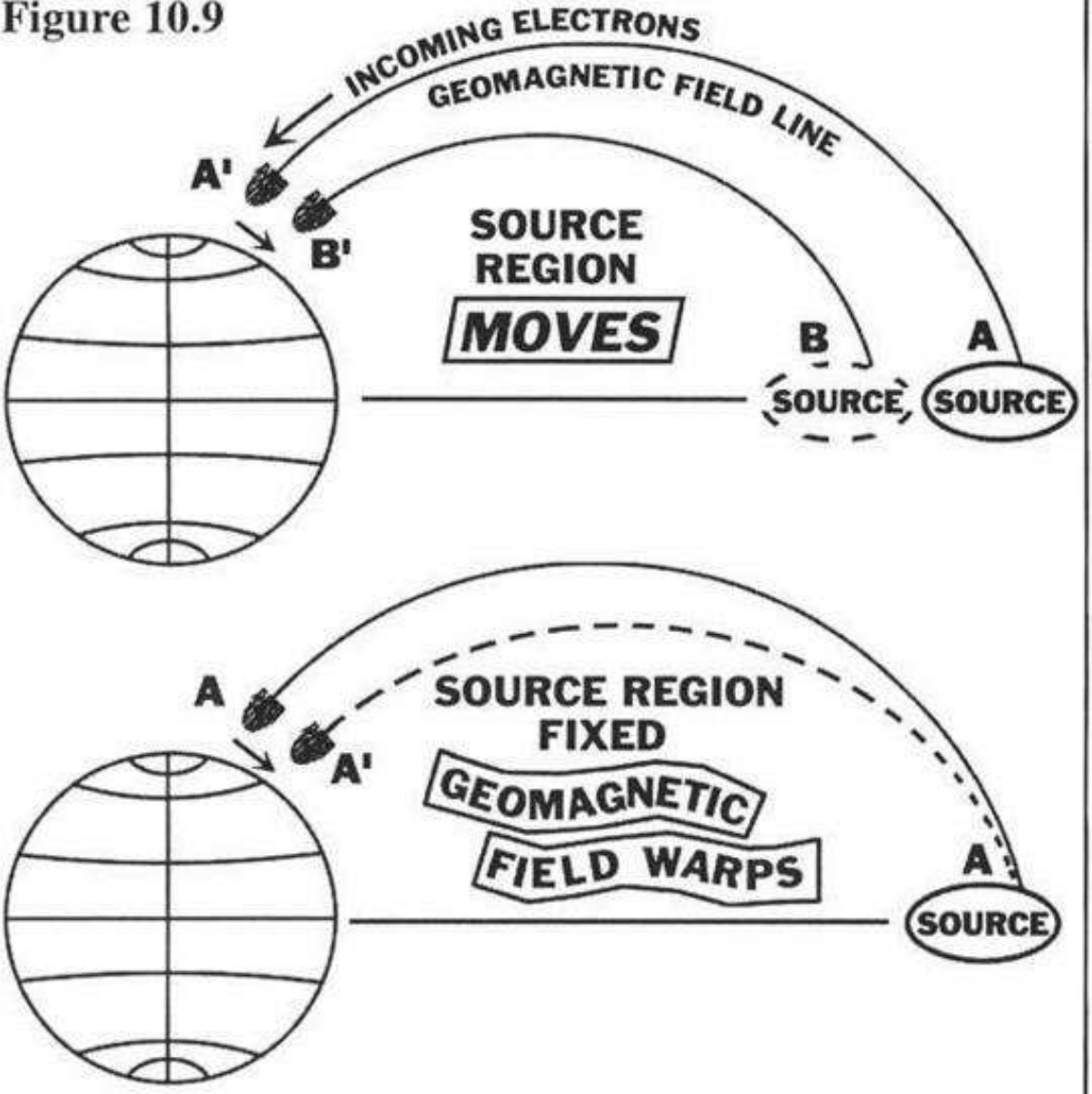

Sketches showing how (at top) an inward-moving source region in the magnetophere's equatorial plane causes a southward-moving aurora in the ionosphere and, at bottom, how warping of the geomagnetic field can cause motion without movement of the source region. Credit: *The Aurora Watcher's Handbook*, Fig 11.2, pg 128.

Davis explains the apparent north-south motion of the aurora as being due to either one of two causes. Either the source from which the charged particles are coming is itself moving closer to the Earth (to cause the aurora to move southward). Or the geomagnetic lines of force are being warped in

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some way. This is illustrated in Figure 10.9. Davis writes:

> **It is also possible to have large-scale motions of auroral forms even though their source regions in the distant magnetosphere remain fixed**, **because the geomagnetic field undergoes warping as illustrated in the lower panel of Figure 10.9**. The incoming streams of charged particles constitute sheet-like electrical currents, and these currents have magnetic fields.[24]

I wondered if the Hollow Planet scenario could perhaps result in an explanation which could tie up all the loose ends which geophysicists are currently struggling with. Take a look at Figure 10.10.

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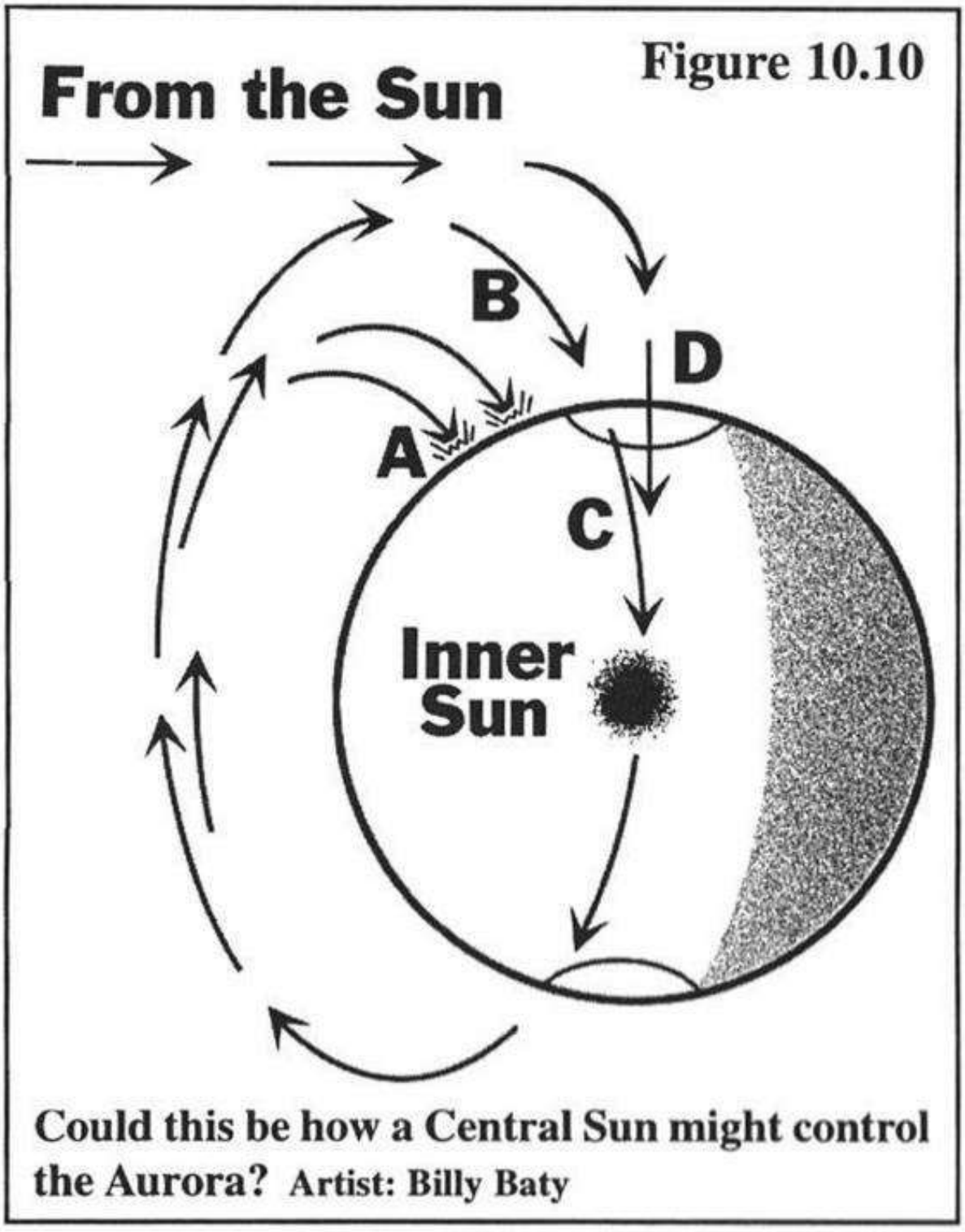

Could this be how a Central Sun might control the Aurora? Artist: Billy Baty

Let me attempt a Hollow Planet explanation of the Earth's aurora—and judge for yourself whether this scenario makes any sense.

A solar flare erupts on the surface of the Sun, sending charged particles

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racing outwards towards the planets. Most of the particles are repelled by the Earth's atmosphere except for those occasions when the Sun's magnetic field points southwards. Only these particles can slip through a weakness or a hole in the Earth's magnetosphere. (A hole which has yet to be discovered I might add). These southward moving particles are then channelled by magnetic lines of force into a hole in the crust of the Earth. This happens to them because the Earth's magnetic field originates from this point.

They enter this hole in Figure 10.10 along the line marked D. They follow the magnetic lines of force through the Inner Earth and exit at a south polar entrance. Under normal circumstances they would continue to encircle the Earth forming a doughnut-shaped belt, which we call the Van Allen belt.

Under normal conditions these particles possibly continue orbiting into and out of the Earth for days and weeks on end. They are constantly travelling in this circular motion. Could this be how these particles are gradually accelerated? Remember how Prof. Davis and the other scientists imagine that the particles a re bouncing back and forth in magnetic bottles in the Van Allen belt? What if they're not bouncing at all? What if they're actually circling through the Earth and gradually being accelerated in the first place?

In Figure 10.10 a stream of electrons produced by the Inner Sun might exit the Earth via its south Polar Hole and then be guided by the magnetic lines of force. These electrons would then go around the outside of the Earth and enter the Earth again at point C. In this manner these electrons would continuously circuit the Earth without there being any indication whatsoever of their presence. There may be other streams of charged particles which move in the opposite direction by exiting via the north Polar Hole and entering through the south Polar Hole. These two opposing streams of charged particles would be encircling the Earth in opposite directions—endlessly. This might be the cause of the Van Allen belt—which surrounds the Earth.

Remember the possible connection between a south pointing solar magnetic field and auroral storms? Prof. Davis and most other scientists in Europe, America and Russia are residing in the northern hemisphere. For them it is probably true that a south pointing solar magnetic field triggers auroral storms in the northern hemisphere. What if a north pointing solar magnetic field were the cause of auroral storms in the southern hemisphere? This seems to me to be a logical conclusion to draw. Hence I'm suggesting

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that perhaps there are two opposing streams of charged particles are circling through the Earth.

Let's suppose that these streams continue circling around and through the Earth for days and weeks on end. Then a "magnetic storm" is triggered by the Central Sun. The Central Sun may then bend the magnetic lines of force causing them to now strike the Earth's atmosphere thereby causing the aurora quite a considerable distance away from the polar entrance—for example at point B. As the Central Sun's activity intensifies it perhaps bends the magnetic lines of force even more so that the auroral oval widens and the aurora moves southwards to point A.

It seems from the evidence that most of the particles do indeed originate from the Sun. However, there may be a small percentage contributed by a tiny central Sun inside the Earth. Figure 10.10 might be able to give an insight into a number of problems which currently puzzle scientists:

1. Figure 10.10 shows why the aurora is controlled at the equator—because the Inner Sun floats in the center of the Earth.
2. The particles from the Sun are far too slow to cause the aurora. By circulating the Earth continuously, they might be accelerated around the Earth until they have the necessary velocity. Perhaps the magnetic field is responsible for this acceleration. The magnetic field, being stronger inside the Earth might be "pumping energy" into the circulating charged particles. They have to be speeded up considerably before they have the necessary energy to create the aurora. [There must of course be many other particles striking those regions but without the necessary energy to create an aurora. The aurora is simply the result of stored particles which have acquired the necessary acceleration. If the Van Allen belts happen to be empty during a magnetic storm then there can't be an aurora. There are many instances where there have been magnetic storms without an accompanying aurora. This would seem to be confirmation of the idea. Prof. Davis refers to the Van Allen belt as being akin to a "leaky water tank". As you pour water into it, so some runs out of it. However, the more water you pour into it the greater the rate of leakage.]
3. The aurora would only be caused by those particles on the "edge" of this "circuit" which strike the Earth's atmosphere—hence the very narrow

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"sheet" of particles. These particles would be "used up" as they strike the atmosphere.

4. Prof. Davis states that a south pointing solar magnetic field causes very powerful auroral displays. I suspect that this is mostly true only for the northern hemisphere and that the opposite might be true of the southern hemisphere—that a north pointing magnetic field would cause a more intense magnetic storm in the southern hemisphere. This idea needs to be tested.
5. With reference to (4) above, it should be noted that the particles from the Sun do not directly cause the aurora. Davis's own diagram, Figure 10.9 shows this clearly. The charged particles with the energy to cause the aurora come from the equator. The variability of the magnetic lines of force causes them to strike further away from the pole.
6. Once the magnetic field has been bent and all these stored particles have been "unloaded" into the polar atmosphere, then there is nothing left to cause an aurora—except for the electrons and other charged particles which emanate from the Inner Sun itself. [This would explain why after the auroral breakup, when all is quiet, the pulsating aurora takes over. The pulsating aurora must thus be charged particles created directly by the Inner Sun itself. The pulsations correspond to the pulsations of the Inner Sun itself. The Inner Sun may therefore contribute some charged particles to the aurora, but only a small percentage of the total amount.]
7. Let us consider one possible explanation for the behavior of the pulsating aurora. Note how there were various pulsations. Some of these pulsations were "in step" but many were not. The ones which scientists found extremely difficult (nay, virtually impossible) to explain were those which were exactly synchronous. Now let's suppose that the Inner Sun has its own pulsations and reactions. It's surface would give off radiation in different directions. Now sometimes, perhaps, the northern and southern hemispheres of the Inner Sun may give off pulsations which happen to be exactly synchronous. The resultant particles would travel out of the Earth, and around it, to the opposite hemisphere. These particles would have the same distance to travel to opposite points on the surface of the Earth. Hence one would end up with auroral pulsations at opposite ends of the Earth which are exactly synchronous. [Note too that Prof. Davis never found any evidence whatsoever of exactly out-of-phase pulsations—which argues very strongly against the current

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magnetic bottle explanations.]

8. There may be another indication that the direction of the Sun's magnetic field plays a role in getting charged particles into the Earth's atmosphere. Davis writes:

   Near the auroral zone, the main factor determining the number of auroras seen throughout the year is the amount of darkness. At lower latitudes, however, a spring and fall maximum is noticeable. The reason is thought to be that in these seasons the Earth is farthest north or south of the Sun's equator. Therefore, in spring and fall, the Earth is more likely to intercept enhancements of the solar wind that emanate from the vicinity of sunspots.[25]

Or is it perhaps that in March and September when the Earth is furthest north or south that more charged particles are able to enter the holes in the Earth's magnetosphere?

VAN ALLEN BELTS

I have mentioned above that perhaps the Van Allen belts are caused by charged particles circulating into and out of the Earth (as peculiar as that sounds). In his e-mail dated 30 Aug 1997, Davis had made this rather interesting comment:

> **When the Van Allen belts were first discovered some people thought that they had finally found the source of the aurora; the Van Allen belt particles.** They were wrong though, because the auroral particle region is outside the Van Allen belt region, however the boundary between the two is not distinct and almost surely depends on time. . . The auroral hydrogen arc . . . is perhaps due to particle precipitation from the outer Van Allen belt. Summarizing, in one sense the outer portion of the Van Allen belt seems to overlap the inner part of the auroral particle region—they are not the same but they may at times occupy the same regions of space— depending on the level of activity, that is, basically how hard the solar wind is blowing. At times of very severe disturbance, the times of great magnetic storms, the auroral region pushes deeply into the Van Allen Belt region.

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It would seem that scientists did indeed think in a manner somewhat similar to what I have proposed. From Davis's explanation one can see that there are a number of fuzzy areas even though he discounts the Van Allen belts as the source of the aurora. There seem to be other belts which operate in a similar manner and there seems to be a great deal of overlap and interaction between them all.

AURORAL UNKNOWNS

The aurora is a highly technical and extremely complex subject. In this chapter I have tried to give the Reader a reasonable summary of what is known about the aurora. There are various facts—for example that electron beams can travel along magnetic lines of force and cause an aurora thousands of miles away. This is known because experiments have been conducted whereby electron beams have been fired from rockets into the magnetic field, and these particles have been seen moving along the magnetic lines of force. These are facts. But there is also theory. For example, scientists do not know where exactly the electrons come from in the first place—i.e. how exactly they enter the magnetosphere, or how they are subsequently accelerated. So various theories have been developed to explain these things.

Many people often confuse theory with fact. Just because a scientist has a theory about something does not imply that his theory is fact. Or, just because a certain theory is taught, does not make it fact. It is simply the best explanation consistent with the known facts and paradigm of that time.

The aurora is better understood than it was a few decades ago. However, much mystery remains regarding this phenomenon. As I studied the literature it seemed to me that perhaps Hollow Planet theory could contribute something to the subject. There might be a relationship between the aurora, or parts of the aurora and an Inner Sun.

The ideas I have submitted above are but the results of my own ruminations. Perhaps some of what I say holds some water? Perhaps not. However, scientists are currently so utterly blinkered that many of them tend to feel that only their explanations are consistent with the scientific facts at all. I simply wish to demonstrate that solid Earth theory might perhaps have more short-comings than one may realize. But one will only see that when one looks at things from a totally different angle. I have raised a number of valid issues in this chapter about the aurora. However, the aurora, and the

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physics of the upper atmosphere is a very dry subject and I do not wish to have the Reader falling asleep and missing vital points.

There are other issues which I did dig into, but which I have decided to leave out for now. Perhaps they can be revisited in the future. For example. There are extensive electric currents which emanate from inside the Earth. Are these induced by the aurora, or is there a relationship to a Hollow Earth?

There seems to be much more to the aurora than mere charged particles coming from the Sun. Some of these links point strongly to an earthly mechanism which works in conjunction with these charged particles. For example, there is the mystery of auroral sound. This remains a subject which most scientists steer clear of. Prof. Davis provided some examples of reports of auroral sound. He quoted a number of reports from scientists and engineers who were working in the auroral zone. Some of the reports are very convincing. Auroral sound is absolutely impossible according to current auroral theory. For auroral sound to be real there may have to be a link with electric currents on the surface of the Earth. Yet, according to current auroral theory, the charged particles are stopped dead in their tracks 80 km above the Earth. The particles have so little energy that they can't possibly create sound. Furthermore, several minutes would lapse between the time the aurora is seen and the sound is heard—yet, the testimony of dozens of eyewitnesses shows that auroral motion is exactly synchronous with auroral sound. This, according to our physics of the present time is absolutely impossible. Davis has accumulated enough reports for him to believe that auroral sound seems to be real. However, whether it really is sound, or some type of electrical discharge is another question. The weight of the evidence suggests that an electrical discharge is taking place on the ground which is synchronous with charged particle motion (i.e. the bending of magnetic lines of force) above one's head.

Now if the aurora has a purely extraterrestrial origin, then this could never be. However, the solution to the problem of auroral sound might well be linked with an understanding of Hollow Planet theory. The existence of an Inner Sun may well be the answer to the problem. If this Inner Sun is creating the magnetic field, and controlling electric currents inside the Earth, then one may well have a solution to the problem.

Another "impossible" auroral occurrence is that of low-level auroras. Again, I do not wish to bore the Reader with the entire subject. But, several low-level auroras have been seen. Many at a height of less than 50 km—

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which is impossible. The charged particles simply do not have the energy (so the theory goes), to reach such a dense part of the atmosphere. And, then there are accounts too, of ground-level auroras. These reports, though few in number, are sometimes from very credible sources. Again, current auroral theory cannot cope with these reports.

What further complicates matters is that scientists have created artificial auroras which look like the real thing, but which do not work on the same basis. In 1881–2 on several mountain tops in Lapland, Prof. Selim Lemstrom mounted arrays of wires studded with sharp points. He managed to create an artificial aurora 400 ft long. To the best of my knowledge, Lemstrom's work has however never been followed up on.

Then there is the possible link between the aurora and weather. This is another "impossible" link. Charged particles from the Sun simply do not have enough energy to create sound, much less, to create clouds and affect the weather. However, there is evidence to suggest some correlation. The physical mechanism by which these phenomena could possibly be connected eludes all scientists currently. But what if a Central Sun could affect not only the outer atmosphere, but electric currents and perhaps even the weather of the Earth? This is something we will examine in the chapter on meteorology. Even that which we think is fully understood is not:

> . . . It is fair to state that scientists still lack is a full comprehension of how and exactly where particles contained in the solar wind enter the magnetosphere boundary. That problem fringes on another, the nature of the auroral substorm.[26]

I asked Prof. Davis to comment on the current state of knowledge regarding the entry point of charged particles into the Earth's atmosphere. On 30 Aug 1997, he replied as follows:

> . . . **Just where the particles come in is so poorly known that maybe people do not have strong ideas on it**, although I am sure that some people think more comes in from the front than the back of the magnetosphere. The main controversy I see in this arena is that some people think that the solar wind determines everything, including the triggering of substorms. The opposing view (which I share) is that substorms are triggered internally within the system (although their size

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> and frequency is surely controlled by the characteristics of the solar wind). . . and therein lies the main controversy I am aware of—and it persists I think among many people who are knowledgeable on the topic. A major proponent of the 'solar wind controls everything' view is Syun Akasofu, director of the Geophysical Institute here at the University of Alaska. But we remain friends anyway, and truth is that I do not know which view is correct—if either is.

The mystery of the path by which particles from the Sun enter the Earth's magnetosphere seems to remain. And:

> Nor is it known in detail how charged particles, once inside the magnetosphere, become accelerated enough to penetrate as deeply as they do into the polar atmospheres.[27]

And:

> In short, unknowns abound throughout the vast region that begins on the Sun and ends in the polar atmosphere.[28]

I wish to stress to the Reader that the aurora is far from perfectly explained. The really difficult mysteries remain—and there is evidence out there for which theories cannot even be proposed within our current paradigm. The aurora may be extremely complex, and it may consist of many different factors working together and perhaps being controlled from the "core" of the Earth.

MERCURY

Now that the Reader is somewhat familiar with the aurora I would like to point out that Mercury seems to behave in a manner amazingly similar to the Earth. W. Metz had this to say in 1974 about Mariner 10 discoveries:

> . . . that the magnetic field does not seem centered on the planet, that high energy electrons and protons are accelerated in some cyclic fashion that is still mysterious.

Scientists had not expected Mercury to have a magnetic field. They had also

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not expected to find that charged particles were being accelerated to such high energy levels (100 kev) through the action of the solar wind. He continued:

> Furthermore, the large fluxes of electrons showed six second fluctuations that were at times accompanied by similar fluctuations of protons. Such well-defined structure was certainly not expected in the streams of high energy particles, and it will probably be quite difficult to find a physical mechanism that will accelerate particles with opposite charges simultaneously.[29]

Mercury seems to behave amazingly like the Earth—except that Mercury has no aurora. But what if Mercury were hollow and it had only a temporary outer atmosphere? Mercury could then perhaps accelerate and control charged particles exactly like the Earth, except that there is no atmosphere which would ever produce a visible aurora. Or if there is one it would be so weak as to be barely visible.

THE DYNAMO LINK

The idea that most aspects of the aurora may be linked to events at the core of a Hollow Planet may well seem absurd, so let me offer some evidence. The pulsations of the pulsating aurora definitely seems to have an earthly origin and to be related to whatever "dynamo" it is which creates the Earth's magnetic field:

> **Pulsating auroras are usually accompanied by geomagnetic pulsations**, **and very rarely by faint whistling sounds.** They also appear to generate 3,000 mc radio waves.[30]

Or is it that whatever generates the 3,000 mc radio waves also generates the geomagnetic pulses as well as the pulsating aurora?

It turns out that the night sky pulsates of its own accord. An interesting study resulted in the discovery of atmospheric brightness pulsations lasting about one millisecond, consisting of damped oscillations at a frequency of approximately 10 kHz. The energy of a single pulsation is roughly 4×10^8 ergs per cm^2 and is not visible to the naked eye. Long baseline observations have demonstrated that they have a terrestrial origin. They were discovered

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accidentally in 1970 during a search for pulses of fluorescence caused by cosmic-ray photons. These flickers are hard to explain in terms of terrestrial atmospheric physics.[31]

Could it be that the flickers in the night sky and the pulsations and radio waves of the pulsating aurora are all caused by an Inner Sun?

Prof. Davis refers to the "almost-explosive" and "burst-like" events which take place in the atmosphere during auroral substorms, and displays—as if something is pumping energy into the atmosphere. He tells us that enormous amounts of energy are injected into the charged particles. For example:

> Energy is the important thing, and much of it is involved in magnetospheric processes. **The substorm injection events that bring energy into the trapping region may**, **in a few hour's time**, **deposit energy equal to that released by a Richter magnitude seven earthquake or a one megaton nuclear weapon.**[32]

The electric current in the atmosphere in the region around the auroral oval exceeds 300,000 amperes. The current flows across the polar regions and around it. There is a tremendous amount of electricity high up in the polar atmosphere. Where does all this energy come from? Does it perhaps originate from a tiny nuclear Sun sitting in the center of the Earth?

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Chapter 11: Underground Radio Waves

In the previous chapter I speculated that perhaps something inside the Earth (Central Sun?) was generating the pulsating aurora and the radio waves which accompany it. In this chapter, we will discuss the opposite possibility —that radio waves might enter the Earth and bounce around inside it.

RADIO BASICS

We will now delve into some of the stranger aspects of radio, so we need to understand the basics of radio wave propagation. The ionosphere is a layer in the atmosphere which extends around the world. The air in the ionosphere is extremely thin. The scattered air particles are ionized, or electrified by the removal of electrons (negatively charged particles). This ionization is (supposedly), caused by the constant bombardment of air particles by cosmic rays from the Sun. This ionized air forms in layers that reflect radio waves back to the Earth, making it possible for us to receive radio waves from beyond the horizon. The layers are known as the D, E and F Regions.

Far less than 1% of the particles in the ionosphere are ionized. Almost all of the particles in the ionosphere are electrically neutral. However, the minute amount which are ionized have a profound effect on the behavior of the region. The D Region is the lowest of the ionospheric layers. It’s peak ionization density is at about 60 km. The D Region decays quickly because the density of the atmosphere is such that electrons, positive ions and other constituents recombine to form neutral molecules. There are thus many more ionized particles on the day side, compared to the night side of the Earth. There are approximately ten times more ionized particles on the day side than on the night side of the Earth.

The E Region lies above the D Region, at an altitude of approximately 110 km. Here the concentration of electrons and positive ions is about 100 times greater than in the D Region. The day/night ratio for the E Region is the same as for the D Region (i.e. 0.1 as many particles on the night side.)

The F Region lies higher still, at an altitude of 250–300 km. The concentration of ionized particles in this region is even higher than in the E Region. During the daytime there are approximately 10 times the number of

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ionized particles found in the E Region. At night however, the F region ionization decays to about 0.2 its daytime value.

These ionospheric layers affect radio wave propagation in different ways. When the D Region is dense it tends to absorb the radio waves destined for the F Region. The E Region supports electrical currents in the upper atmosphere. The F Region is important to long-distance communication because it reflects radio waves sent up from the Earth below.

The charged particles which create the aurora tend to also create profound changes in the ionized layers of the atmosphere. They create additional ionization to that produced by cosmic rays from the Sun. In the auroral zone, the ionosphere is very chaotic compared to the lower latitudes. The F Region becomes more reflective to radio waves, while the D Region's ability to absorb radio waves becomes greater. Long range radio communication in the 1–20 mHz range becomes virtually nonexistent in the auroral regions during auroral displays. The high-frequency signals used to communicate with satellites in space are also affected, but not as much. The aurora tends to also generate radio waves which create additional interference in radio communication.

Radio wave communication in the frequency range (1–20 mHz) normally employed for long-distance transmissions at low and middle latitudes becomes essentially non-existent in the auroral regions during extensive auroral displays. Even the high-frequency signals used to communicate between satellites and the Earth's surface are adversely affected, although not so severely. Processes associated with the precipitation of auroral particles also generate radio waves in a broad range of frequencies, and these can cause additional interference."[1]

LONG DELAYED RADIO ECHOES

One of the mysteries of radio is a phenomenon which has come to be known as the Long Delayed Radio echo (LDE). Radio waves move at the speed of light (i.e. 186,000 mi/sec). The Earth is slightly less than 8,000 mi in diameter. Thus a radio wave can move virtually instantaneously around the world. The Earth's circumference is slightly less than 25,000 mi. A radio wave can travel completely around the world, bouncing between the ground and the ionosphere, in approximately 0.143 sec.

Back in the late 1920s, European scientists first discovered the existence

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of LDEs. These are transmissions which are echoes of earlier transmissions. As mentioned above, some radio waves will travel all the way around the world and be “echoed” back to the sender in approximately 0.143 sec. Some even bounce off the Moon, some 240,000 mi away. These echoes take 2.6 sec to travel to the Moon and back. Hence scientists and radio amateurs are familiar with these two echoes—0.143 and 2.6 sec.

It was thus something of a surprise when echoes occurred of 8 sec, 11 sec and so on. These LDEs are extremely rare. Some estimates put them as one occurring in every two million transmissions. Most LDEs have echo times of under 30 sec, but some have been recorded with times of up to 5 minutes. They normally occur in the frequency range of 810 kHz to 144 mHz. On rare occasions there are multiple echoes from the original signal.

In recent decades radio amateurs have begun compiling observations of this phenomenon. LDEs are more common than once thought. However, the mystery still remains. Scientists have also tried to find out just what causes these echoes . Professional scientists and radio amateurs have recorded LDEs in large numbers for over fifty years.

The original discovery of LDEs resulted in some sensational publicity. Some people have gone as far as proposing the existence of alien space probes carrying radio-repeaters! LDEs still occur and are heard by amateurs and professionals alike. Many of the delays are so long that whatever they are bouncing off must be located well beyond the Moon. Natural clouds of ionized matter in space are among the answers proposed. It was once thought that the signals were bouncing off sheets of solar plasma far beyond the Moon’s orbit. However, more detailed studies have caused scientists to conclude that these radio waves are actually being trapped here on Earth. It has been proposed that somehow they get trapped in ionospheric ducts for several seconds and are then somehow released. During this time they may have orbited hundreds or thousands of times around the Earth. Although this idea is attractive, no one knows why some signals are detained and then released back over the original transmission area. The radio echoes do not always occur over the original transmission area. They can in fact be released anywhere. It is simply that it is most likely that the original sender will be the one who will notice these strange echoes as being anomalous. LDEs may of course be caused by several different factors.

One possibility which no one has ever examined is whether these radio waves might be bouncing around inside the Earth! This is an idea which has

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occurred to me while doing my feasibility study. While thinking about this Hollow Planet idea I wondered to myself if radio waves could bounce into a Hollow Planet? This idea is of course only valid if a planet actually has gigantic holes in it which would allow radio waves to bounce into and out of the planet. It's a strange thought to be sure because one does not know how the ionosphere will be shaped in the vicinity of a hole leading into the crust.

I was struck by the strange nature of the LDE problem. It seemed very consistent with the idea of radio waves bouncing around inside a gigantic hollow ball. The curvature of a Hollow Planet would be such that radio waves could bounce around it almost ad infinitum until they lose their strength. A key issue was the greatly varying LDE time delays. The fact that time delays varied so much seemed to be to be extremely strong evidence suggesting that these waves were bouncing around inside a hollow cavity. One does not know whether there would be an ionosphere inside the Earth too, and the exact path such waves might take. Would they bounce directly across the cavity, or would they too follow some kind of ionosphere's curvature? Since one is also considering the existence of some kind of nuclear central Sun inside the Earth, as an integral part of this overall idea, it seems to me to be theoretically possible that it might produce an ionosphere inside the Earth. After all, it seems to me that there has to be an atmosphere inside Hollow Planets, perhaps even more so than on the outside. Perhaps some kind of ionospheric layer exists somewhere inside? After going through the evidence it seems to me that there might be a theoretical case for an inner Earth ionosphere.

Could a radio signal be "stored" inside the Inner Earth by having it bounce around therein? This could only happen if the Earth's crust contains one or more gigantic holes in it. A signal could enter via the north or south Polar Holes. Exiting from the Polar Holes should be extremely difficult since they surely only cover a small fraction of the Earth's surface area. A signal could bounce around inside the Earth until it loses all its energy, never to emerge. But on rare occasions when the conditions are right, it might just be able to emerge again over the same area from where it was transmitted. One therefore expects a direct correlation between the strength of the echo and the time it spent inside. The longer the echo, the weaker the signal.

SOME AMATEUR TESTIMONY

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As an experiment I asked radio hams on Internet whether any of them had experienced LDEs. A few had. Here is some of their personal testimony. I did not bother giving their full names and e-mail addresses simply because there are proper studies of this phenomenon out there. I merely wanted to gauge how real and how common this phenomenon was. Ray wrote:

> I don't know much about these but once had a conversation about them with a radio ham who is also quite knowledgeable in physics. **I gather that there is no accepted explanation but that the phenomenon is quite real**. . .
>
> Given that the delays imply a size for the echo region which is larger than the Earth it seemed to me that it might be related to the boundary zone between the Earth's and Sun's magnetic field. This changes in size and shape and is generally of about the right size I think.

If only LDEs were that easily explained! We will be examining the many varied characteristics of LDEs which defy such explanations. Jim wrote:

> A few years back during the peak of the last sunspot cycle a few ham friends of mine and myself would hang out 28.305 mHz on a daily basis. Two of us were up very late one night (about 2–3 am local) and we experienced LDE for about 45 sec. It was very weird, about half second echoes. We had a few transmissions each back and forth then the echoes shortened and disappeared. The band appeared to be dead but who knows at that time in the morning. It was winter time and there was no evidence of F layer or sporadic E propagation. Our stations were about 20 air mi apart and the phenomenon did not ever reoccur. Very weird!

Jim was certain that it was not caused by E or F layer problems. Joe wrote:

> I had looked into LDEs a few months back by doing a subject search of articles published in *QST*. I was able to pull up quite a few listings from 1970s to 1980s on the subject. . . I faxed one of these to Art Bell (W6OBB) who does an AM radio show in the evenings and he discussed the subject on the air for a few minutes, noting that he'd often heard LDEs of his own signals on 75 m.

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Lynn wrote:

> I was sending RTTY about eight years ago or so. I was beaming to either the northeast or the northwest. When I let off the transmitter, I started receiving my own transmission. I don't recall for sure, but possibly 2 sec worth, could have been longer. Interesting!!! That would have been on 20 m.

Lynn's transmission might have bounced off the Moon—because the 2 sec she mentions sounds similar to the 2.6 sec reflection time from the Moon. Of course whether she could have been pointing the transmitter at the Moon is questionable. The Moon is always within approximately 27° of the equator. The echoes she heard must have travelled approximately 370,000 mi in those 2 sec. But where had they gone? Of special interest is that she was pointing her transmitter either to the north east or the north west at the time. Had her transmission entered the Earth?

Bob wrote:

> I'm not sure if this is what you are referring to. When I was stationed in Alaska during the 1956–8 period, we were at the peak of one of the more active sunspot cycles. On occasion, when listening to another station, I could hear a word, then a brief moment later an echo. I always thought it was just the signal going clear around the world and coming by a second time. I suppose it could also have been the same signal going the long way around and reaching me with some delay. I believe, from memory only, that this would have been on 10 m or 15 m. I didn't work a lot of 20 m, except on CW in those days. I was at Tok Junction, on the Alcan Highway, roughly 200 mi south of Fairbanks."

Bob was stationed in Alaska when he experienced these very short LDEs. Were they around the world echoes? Or could it be related to the possible existence of a Polar Hole? Since Alaska, Russia and the North Western Territories of Canada are close to the Arctic, is it possible that LDEs will be more common in these regions? Could it be easier to bounce radio waves into the Earth from there?

Consider the following testimony from a fellow who was in the British military during the Falklands war. He was stationed on South Georgia Island in the deep southern part of the Atlantic at the other end of the world. He

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replied to my survey as follows:

> I've experienced the same phenomena while working as VP8 down on the Island of South Georgia (South Atlantic).
>
> My equipment was military HF with about 500 W PEP into a caged dipole array up at 45 m in height. Frequencies in use were approximately 13–15 MHz and as this was a few years ago I do not recall the time or date, but it WAS in the daytime.
>
> The effect was such, that when I ceased my CQ call, I actually heard my own voice repeating the last word. . . 'QRZ'! It was very strange to say the least, and as it was a transient effect and disappeared after about 30 sec or so, no one would believe me. . . The conditions down on south Georgia were ideal for receiving as there was a complete absence of local QRM (No street lights, electric thermostats etc). Hope this helps you out as you're the first person that has mentioned this phenomenon."

I also communicated with another gentleman in Canada, an amateur radio ham who was busy conducting his own experiments into the phenomenon. The phenomenon seems to be real enough, and much scientific literature exists about it.

LDE HISTORY

Let us examine some of the scientific history of this subject. One of the first scientists to study this phenomenon was the well-known geophysicist Carl Stormer.

> On 29 Feb of this year I received a letter from Engineer Jorgen Hals, Bygdo, Oslo, in which he says: 'I herewith have the honor to advise you that at the end of the summer 1927 I repeatedly heard signals from the Dutch short-wave transmitter station PCJJ (Eindhoven). At the same time as I heard the telegraph signals I also heard echoes. **I heard the usual echo**, **which goes round the Earth with an interval of about 1/7 sec**, **as well as a weaker echo about 3 sec after the principal signal had gone. When the principal signal was especially strong**, **I suppose that the amplitude for the last echo 3 sec after lay between 1/10 and**

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> **1/20 of the principal signal in strength. From where this echo comes I cannot say for the present. I will only herewith confirm that I really heard this echo'**.[2]

The above case Jorgen Hals was in Norway and he was hearing echoes from a Dutch transmitter. This is an example of the signal being "released" somewhere other than the original transmission area. Then the Dutch scientist, B. Van Der Pol became involved and a joint experiment was devised. It was conducted during the spring and summer of 1928 in Oslo, Norway and Einhoven, Holland.

They began experimenting in March 1928. They used the short wave transmitter PCJJ, operating on 31.4 meters. They arranged for a special series of signals to be sent. They repeated the experiment sometimes twice, and often four times a week. They waited for echoes both in Oslo as well as Eindhoven. Several months passed by without them hearing any echoes.

Suddenly, on 11 Oct 1928, Prof. Stormer sent a telegram to Van Der Pol stating that very fine echoes had been heard that afternoon. They decided to try the experiment again immediately. They transmitted three short dots in rapid succession every 30 sec between 2000–2100 that evening. Van Der Pol and his assistant waited and listened for echoes of the 120 signals. The two of them heard 13 echoes. The echoes occurred: 8, 11, 15, 8, 13, 3, 8, 8, 8, 12, 15, 13, 8 sec after the original signals were sent. The radio frequency of the echoes were always exactly equal to the frequency of the original signal. The signals were "unmodulated," and the receiver was kept oscillating. The resultant combination tone had exactly the same pitch—regardless of whether the original signal was received or whether it was the echo. They changed the frequency of the local oscillator a few times and noted that the echo was now causing a slightly varied pitch. When the receiver was left unaltered, the next real signal caused exactly the same pitch as the previous echo. By changing the frequency they were thus able to determine that the echoes were indeed from the original signal. As Van Der Pol later wrote:

> The echoes I heard were rather weak, and though their oscillation frequency could be easily identified to be the same as the frequency of the direct signals, **the three dots of the original signal could not be recognized in the echo**, **the latter being of a blurred nature**, **except in the one case where the echo came in 3 sec after the signal**, **when**

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the three dots of the original signal were very plainly audible in the echo as well.

Van Der Pol then suggested to Prof. Stormer that they count the signals in further experiments so that the echoes heard in Oslo and Eindhoven could be identified. No further echoes were heard until 24 Oct. Between 1600–1700 GMT. they heard echoes in both Oslo and Eindhoven. In Einhoven they were heard at two different places 3 km apart. Prof. Stormer's notes for that day showed that 48 echoes were noted in Oslo. Receiver 1 at Eindhoven noted four very weak echoes. Receiver 2 at Eindhoven recorded five echoes. Some of these observations are plotted in Figure 11.1.

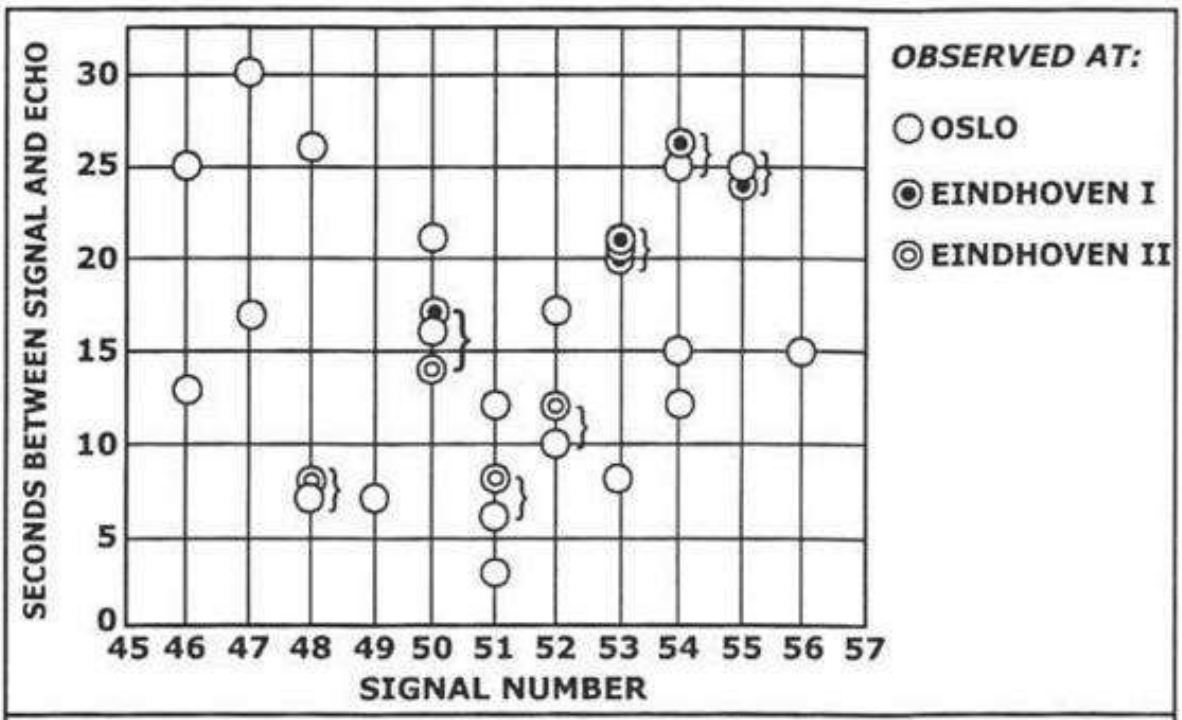

Figure 11.1

Long-delayed radio echos observed by Stormer in 1928. Reprinted by permission from *Nature* © 1928, MacMillan Magazines Ltd.

Allowing for the fact that a stop watch was used, and that there is a bit of human error involved, it can be seen that the echoes were heard virtually simultaneously in the three places referred to above.

Van Der Pol concluded that although LDEs are difficult to observe and

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recreate there can be no doubt that the echoes are real, since they have been heard by several observers at different places—sometimes almost simultaneously.[3] Van der Pol thought there was some connection between LDEs and the aurora.

The Reader should note in the above, the reference to the 3 sec echo. This is very possibly from the Moon. Note too that this echo is much clearer than the others which are almost unrecognizable. Could the other echoes be from inside the Earth?

I wonder if bouncing around inside a Hollow Planet where the curvature is the "opposite" to what it is on the outside might be responsible for some of the garbling of the signal? This "garbling" effect is an inherent part of the LDE problem.

Let us examine some of the results from those experiments in 1928. Firstly, several months went by where no echoes were received at all. Van Der Pol and Appelton wondered if there was a link to the aurora. Now that's interesting, because the aurora and polar activity might help to deform the ionosphere. Could it be that under normal conditions that radio waves can travel across a Polar Hole in the Arctic? Could it be that the ionosphere must be dented to perhaps channel radio waves into and then out of the Earth? When the echoes occur they tend to carry on occurring for a period of time. Note that on this one occasion though, that Oslo received 48 echoes while Eindhoven only received four at one station and five at another? Why was Oslo receiving more echoes than Eindhoven? Could it have something to do with the close proximity of Oslo to the Arctic and perhaps a polar entrance?

Note how many echoes were received at Oslo. Sometimes Oslo received more than one echo of a signal. Consider signal 54 for example in Figure 11.1. An echo was heard in Oslo 12 sec, 15 sec and 25 sec after the original signal. At Eindhoven an echo was heard 26 sec after the original. It is probable that the 25 sec Oslo echo and the 26 sec Eindhoven echo are one and the same. But what then about the first two echoes? Look at Table 1 below. It shows how far a signal would have travelled during a certain time and approximately how many "orbits" of the Earth it would make in that time. The 15 sec echo corresponds to approximately 111 "orbits" of the Earth, while the 25 sec echo corresponds to approximately 186 orbits. The first signal travelled 2.7 million mi while the second echo travelled 4.6 million mi. Note the almost random distribution in the echoes. Echoes are sometimes heard in Eindhoven even before they are heard in Oslo. Clearly,

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the waves are bouncing around the Earth in a strange manner and being released in an even stranger manner. Perhaps some radio waves could enter a Hollow Planet through a northern Polar Hole while exiting from a southern Polar Hole too? Since the aurora tends to behave similarly in both hemispheres that would seem to be a reasonable assumption.

In 1929 a further paper was presented on the matter. In this paper it was pointed out that the long delayed echoes must have travelled a considerable distance, in the order of 300,000 km x t sec (where t is the time of delay of the echo—this is the same as in Table 1 which I constructed below and which reflects distances in miles). It was proposed that the waves were bounding along the surfaces between the ionized layers and the empty parts of space outside the Earth's atmosphere while remaining within the Earth's magnetosphere. It was thought that these ionized layers could create delays of up to 30 or even as much as 60 sec. Stormer thought the LDEs were controlled by the Earth's magnetic field. It was also surmised that even longer echoes were possible from beyond the Earth's magnetic field. It was noted that Jorgen Hals had indeed detected LDEs of 3 mins 15 secs and 4 mins 20 secs.[4]

So by 1929, it was suggested that some waves were bouncing around the ionosphere and being selectively released, while other waves were bouncing far out into space and back.

In 1930, two observers in Indochina studied two thousand echoes from a relatively small emitter station. The echoes took about 30 sec after the signal and their amplitude was sometimes as great as one-third the original signal. Some of the experiments recorded proved conclusively that they were echoes. It was suggested that the space outside the Earth's orbit was traversed intermittently by very unstable streams of electrons. This, it was suggested would explain the great variety of echo times observed.[5]

In 1934, Stormer suggested that the emitted signals penetrate the ionosphere and are reflected back from a belt of electrified corpuscles ejected by the Sun and formed into a vast toroid by the Earth's magnetic field.[6]

For the longer echo times space seemed to provide some possible explanation. They postulated the existence of strange clouds of electrons. But going back to the 1928 experiments detailed in Figure 11.1 one can see that signals sent even 30 sec apart demonstrate a tremendous inconsistency in their behavior. Look at the Oslo echoes for example. Signal 47's last echo occurred 30 sec after transmission. The times fell, until signal 51 was

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occurring after only 12 sec. Then the times climbed again up to signal 54 and then it began falling again. To interpret this in terms of a cloud of electrons one would have to have such a cloud approaching the Earth and then receding at very high speeds! Considering the times between multiple echoes in Oslo, one would also have to postulate a cloud of considerable width. And why would such a cloud only release signals towards Oslo but not Eindhoven—especially considering how far away it is.

Consider some of the testimony so far where some LDEs are fractions of a second—where LDEs match almost exactly the time taken by a signal to go around the world (1/7th of a second). Let us look at the times mentioned above and turn these times into distances to see how far the radio waves travelled:

The above table shows the total distance a radio wave would have travelled. Next to it is half that distance—if we assume that the radio wave was reflected by some kind of reflecting material in space. The final column represents approximately the number of times such an echo could have travelled around the Earth.

Table 1

Travel Time	Distance Traveled	Distance of the "Reflector"	Number of Times Around the Earth
1/7th sec	25,000 Miles	12,500 Miles	1.0
3 "	558,000 "	279,000 "	22.3
8 "	1,488,000 "	744,000 "	59.5
11 "	2,046,000 "	1,023,000 "	81.8
13 "	2,418,000 "	1,209,000 "	96.7
15 "	2,790,000 "	1,395,000 "	111.6
25 "	4,650,000 "	2,325,000 "	186.0
30 "	5,580,000 "	2,790,000 "	223.2
60 "	11,160,000 "	5,580,000 "	446.4
3m15s "	36,270,000 "	18,135,000 "	1,450.8
4m20s "	48,360,000 "	24,180,000 "	1,934.4

The first problem one encounters in attempting to explain LDEs is the tremendous variation in echo times. It is not just a simple case of postulating the existence of a "reflector" somewhere out in space. The Earth is spinning about its axis and this reflector would have to exist in all directions. A 3 sec echo has travelled to just beyond the Moon and back. The 8–15 sec echoes heard during those early experiments travelled a total mileage which varied from 1.5 million to 2.8 million mi. In the space of a few minutes apart, conditions varied such that some signals were reflected at greatly differing distances.

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The distance which these radio waves have travelled so as to take as much as 4 min 20 sec is enormous. An echo with a time of 4 min 20 sec would have travelled a staggering 24 million mi (100 times the distance of the Moon) and back. This would be a total journey of 48 million mi—more than half the distance between the Earth and the Sun!

Echoes with times of three and four minutes are travelling beyond Venus or Mars and then being "reflected back". Earlier, one of the radio hams postulated that the waves were being reflected back by the Earth's magnetic field. The Earth's magnetic field is tear-drop shaped and lies close to the Earth in the direction of the Sun, but very far out from the Earth on the night side.

If these echoes were reflected back by the magnetic field then day-time echoes would be much shorter than night time echoes. The echoes would then have a much more predictable time length. These experiments show no such pattern. The idea of mysterious reflectors lying at varying distances from the Earth becomes untenable when one releases the massive variation in the times of the radio waves. To postulate the existence of multiple spheres of variable reflectors from 12,500 mi all the way out to 48 million or more mi (half the distance to the Sun) makes no sense. Since this can occur almost any time of day or night, it would seem that the Earth would have to be surrounded by an enormous amount of ionized matter to a considerable depth well beyond the reach of the Earth's magnetic field. This would seem to present more problems than solutions to the matter at hand. Compounding the problem is the highly variable nature of the signals. Signals emitted within seconds or minutes of each other in the same direction are reflected back by "reflectors" at tremendously varying distances. Sometimes echoes are not heard for months, then suddenly for a few seconds or minutes they are heard, and just as mysteriously they disappear. This is strange behavior for a "cloud" of ionized material moving past the Earth.

In 1969, Villard summarized the observations of many individuals, especially amateur radio operators. He drew the following conclusions:

1. He noted that multiple-second 'coherent' signal echoes appear to be real. They occur for short periods of time at infrequent intervals (i.e. they are impossible to predict.)
2. Echoes can be heard from one's own station as well as from signals of

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other stations.

3. Echoes seem to occur at 7, 14, 21, and 28 mHz., but not at higher frequencies.
4. Echoes seem to occur most often when a given band is “opening up.”
5. Villard noted: “They seem to be audible when long-distance propagation is good, and when geomagnetic activity is low.”
6. Stations which report echoes normally have their antennas high up in the air at locations good for DX. Other than that no other exceptional facilities are needed.
7. A radio ham who DXes one or two hours a day will probably hear one LDE a year, on average.
8. No Doppler shift has been detected. This means that the “object” they are being reflected from is “standing still” relative to the Earth and is either a part of the Earth or moving along with the Earth in orbit. This point is critical in showing that the effect is caused by something here on Earth.
9. The echo resembles that of a DX signal which travels a long distance along several different paths.
10. The strength of the signal is normally weak. There are however some reports which have put it at a strength of 83 or more.
11. Villard notes: “Echo strength always decays with time, rather than the other way around.” This suggests that the radio waves have travelled a considerable distance and are becoming weaker—as one would expect.
12. LDEs only occur within a short period of time of the original signal being sent. The echoes are heard within a period which is no more than a few minutes of the original signal.
13. One of Villard’s more important conclusions was that: “There is some indication that LDEs may be heard more frequently on signals which have travelled through the northern and southern auroral zones.”[7]

Point 5 is also of great interest. LDEs occur more often when geomagnetic activity is low. It seems that a stable magnetic field is a prerequisite for LDEs. Point 13 is the key to the solution of the phenomenon. LDEs are more common on signals which have travelled through either auroral zone! The auroral zones form an oval in the vicinity of some potential Polar Holes.

Based on points 5 and 13, we can already see a possible connection: Radio waves are being guided inside the Earth along a path matching the

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curvature of the magnetic field. If the Earth were solid this connection would have absolutely no meaning at all. Could it be that at times the ionosphere bends and reflects radio waves into the Earth? The ionosphere in the auroral zone is normally very unstable. Could this be why LDEs are more common when geomagnetic activity is low?

From 1967–70, F. W. Crawford at Stanford, California conducted several LDE experiments. He made observations of LDEs with time delays of about 10 sec. His suggested answer was that "the signals travel through the ionosphere at very low group velocity under conditions in which collisional attenuation is offset by weak beam-plasma instability."[8]

In *New Scientist* in 1971 the problem of LDEs was mentioned again. The three experimenters drew the following conclusions regarding LDEs:

1. **It appears that LDEs tend to be reported at times when magnetic activity is low**.
2. Some psychologists believe that 1 or 2 sec echoes might be a trick of the imagination. However, longer echoes cannot be explained away as "internally generated" by the mind.
3. There seem to be two classes of unusual echoes. One is at 3.5 mHz over short distances where the time delay is 1–2 sec. The other has longer time delays and seen to be associated with long-distance wave propagation. It tends to occur at higher frequencies, especially at times when the band is opening or closing. It is this second class which is of interest to us.
4. **On balance**, **the evidence suggests that both effects are real and associated with the ionosphere**. . .

   The diversity of reported effects is impressive. In longitude, **the locations at which LDEs have been heard range from Africa to the Marshall Islands; in latitude**, **from Peru to Canada**.

The echoes occur in radio frequencies up through 144 mHz while the time delays vary from less than a second up to more than 300 sec (5 min).

Clearly scientists still had not reached a consensus regarding the solution to the LDE problem. So these three scientists suggested a new theory that inhomogeneities in the F layer were causing some of the radio wave energy to be converted into slower moving "plasma waves." These plasma

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waves, travelling 1 Km/s more slowly than the radio waves, could introduce a 10 sec time delay. These plasma waves would then be converted back into radio waves by another "inhomogeneity."[9]

Kindly note how different theories are tried to explain a specific characteristic of the echoes, but what about other results which are at variance with this? For example, these gentlemen only concentrated on LDEs with 10 sec delays.

Also in 1971, C. R. Clark advanced some theories of his own. He stated that 2.5 sec delay LDEs could be reflections from the Moon, while 8 sec LDEs could be reflections from a cloud of ionized gas at the L2 Lagrangian point. (Note: The L2 point is located at a stable region far beyond the Moon, along the Sun-Earth-Moon line).[10]

The 2.5 sec and 8 sec explanations are good. The L2 point might contain matter accumulated in space. But there are many more echoes which cannot be explained in this way.

H. L. Rasmussen in Denmark, experienced some LDEs of his own on 7 July 1974. He was working on 1,296 mHz using moon-bounce transmission. On that day, a series of dots were reflected back from the Moon after 2.6 sec. Then there was a second signal which was delayed by 2 sec. This signal was the same as the moon-bounce signal except that it was weaker. At the time this happened the Sun was almost due west, while the Moon was south-west at an altitude of about 30°. During his second series of transmissions the returning moon signal was again followed 2 sec later by a delayed signal which had the same characteristic note as the transmitter. Later the next day there was a severe radio blackout when a large sunspot appeared on the Sun. So Rasmussen thought that perhaps the LDE had been caused by a large stream of ionized gas from the Sun.[11]

The above explanation seems rather weak. The Sun was due west at the time, and the Moon was southwest. The idea is that ionized gas from the Sun caused the 4.6 sec echo. The idea is that the ionized gases were approximately 180,000 mi beyond the Moon at the time. Such gases would be moving far too fast to take more than 24 hrs to reach the Earth. They would probably have reached the Earth in an hour or so from that distance. This is another example of the difficulties involved when one attempts to use the "reflector in space" type of approach.

By the late 1970s scientists began realizing that LDEs were of earthly origin. In the *Journal of Geophysical Research* there was a lengthy review of

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LDEs, plus the suggestion that they may arise from signals being trapped in ducts in the ionosphere.[12]

In 1980, in QST, a statistical analysis of LDEs confirmed the Earthly origin of LDEs. They decided to search for periodicities in the LDEs. They discovered that most (but not all) delay times were in multiples of 138 ms (the time required for a radio signal to go around the Earth.) This observation strengthened the theory that LDEs resulted from signals that were trapped in ducts in the ionosphere.[13]

If some radio waves travel inside the Earth just as they do on the outside, then it would be very difficult to tell whether a radio wave actually went into the Inner Earth, or whether it went around the outer surface. In 138 ms a radio wave travels 25,668 mi—slightly more than the circumference of the Earth.

The key here is that most LDEs have periods which are multiples of 138 ms. This means that most LDEs never left the Earth. In Table 1 the Reader can see just how many times the various radio waves would have gone around the Earth. Note that not all LDE's have times that are multiples of 138 ms. Could they have bounced around the Earth directly from side-to-side (instead of following the curvature of the inner Earth?) This is one possibility which is not open to solid-earth explanations.

Earth-bound LDEs made many circuits of the Earth. Consider the 8–15 sec LDEs which Prof. Stormer had first studied. They went around the Earth between 59 223 times!

A radio wave can only go around the Earth by bouncing repeatedly between the ground and the ionosphere. It no doubt loses much energy in the process, which explains why they become so weak and are so difficult to detect.

Radio transmission is extremely efficient. When a radio signal is broadcast it is picked up most of the time. Consider the myriad of radio stations around the world which broadcast 24 hrs a day all year long. Think of the BBC World Service for example. These radio waves are broadcast and received around the world.

A central question regarding LDEs is this: Why is it that a radio signal which goes around the world 50 times or 500 times is only picked up after so many circuits? Why would a radio wave go around the world 49 times and not be picked up—yet it is picked up on the 50th circuit? Or why would it travel 999 times around the world and only be heard on the 1,000th circuit?

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Or in the case of multiple echoes, why would it only be picked up on say the 50th circuit and then again on the 150th circuit? (For example.)

You might answer by saying that the radio wave penetrated through a “hole” in the ionized air in the ionosphere, and then it bounced around the world between two layers of ionized air for 49 circuits, then on the 50th circuit it fell through another “hole” in the lower layer of ionized air. Indeed, this is a possibility.

You also have to wonder why LDEs are more prevalent in the auroral regions. Let us examine the currently popular scientific explanation for LDE’s. In Figure 11.2 we see a radio signal from “A” going around the world. Near the poles it enters an ionospheric hole and circles the world (perhaps a number of times), before returning to point A by way of another ionospheric hole. For this to work requires multiple specially placed “holes” in the ionosphere for radio waves to be able to circle the world unheard.

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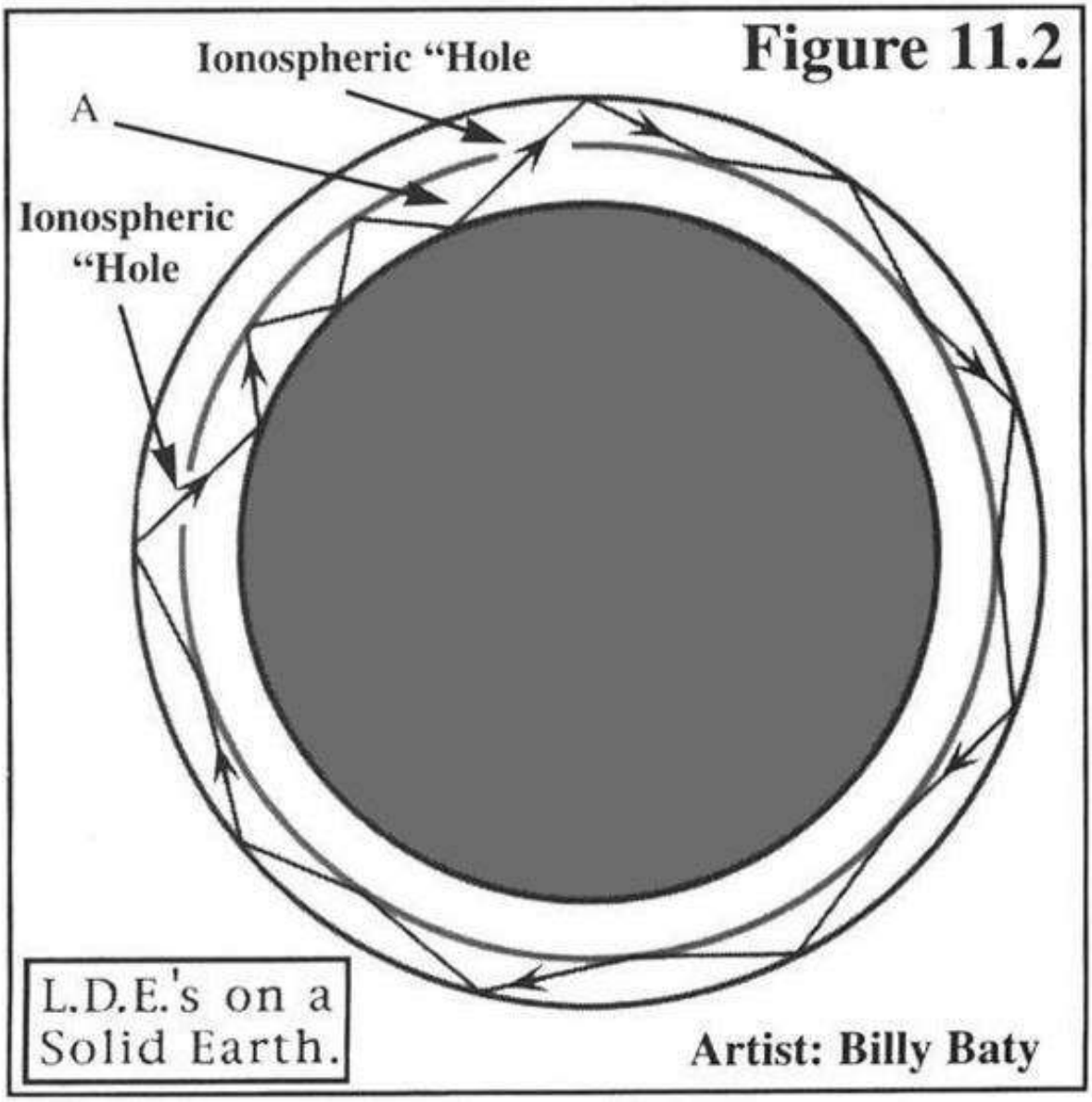

In July 1980 at College, Alaska some very sophisticated LDE experiments took place. A "high-latitude, earth-based high-frequency (9.9 mHz) radio wave back-scatter technique" was tested. More than 2,000 LDEs were detected and recorded between 15–22 July 1980. LDE's also seemed to occur during disturbed magnetic conditions. Robert Freyman wrote: ". . . the modes and paths by which the signals propagate are yet to be established . . ." Freyman reached two important conclusions:

1. There was a possible correlation between LDE's and the possible entry of solar plasma into the magnetosphere.

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2. A single source signal can cause multiple echoes.[14]

Note in the above how many LDEs were obtained d u ring a week in the Alaskan experiment. A s with the Oslo experiments it seems as though LDE's are definitely more common in the polar regions—perhaps because the chance of radio waves entering the Earth is so much greater there?

HOLLOW PLANET LDEs?

Figure 11.3 is a diagram rep resenting some thoughts which went through my mind. How would radio waves propagate into and out of a Hollow Planet? I think there are two broad options. The first option, (A), is that there is an ionosphere inside the planet too. I think that if we are dealing with a nuclear Inner Sun then an ionosphere is perhaps a reasonable proposition. It seems logical to expect a nuclear Inner Sun to also create ionized particles. Exactly how such an ionosphere would be structured is beyond me. I think it would be expecting too much to expect D, E and F regions like those on the outside of the Earth. Exactly at what altitude such an ionosphere would exist is another question which I cannot even speculate about. Perhaps an ionosphere would be small, merely surrounding a central Sun? Who knows. Let us suppose that some kind of ionosphere exists which somehow merges with the ionosphere of the outer atmosphere. Radio waves from point A, might on occasion, bounce into the Earth via a Polar Hole. They might then bounce along inside the planet and, they might on occasion just manage to bounce out through another (or the same) polar entrance.

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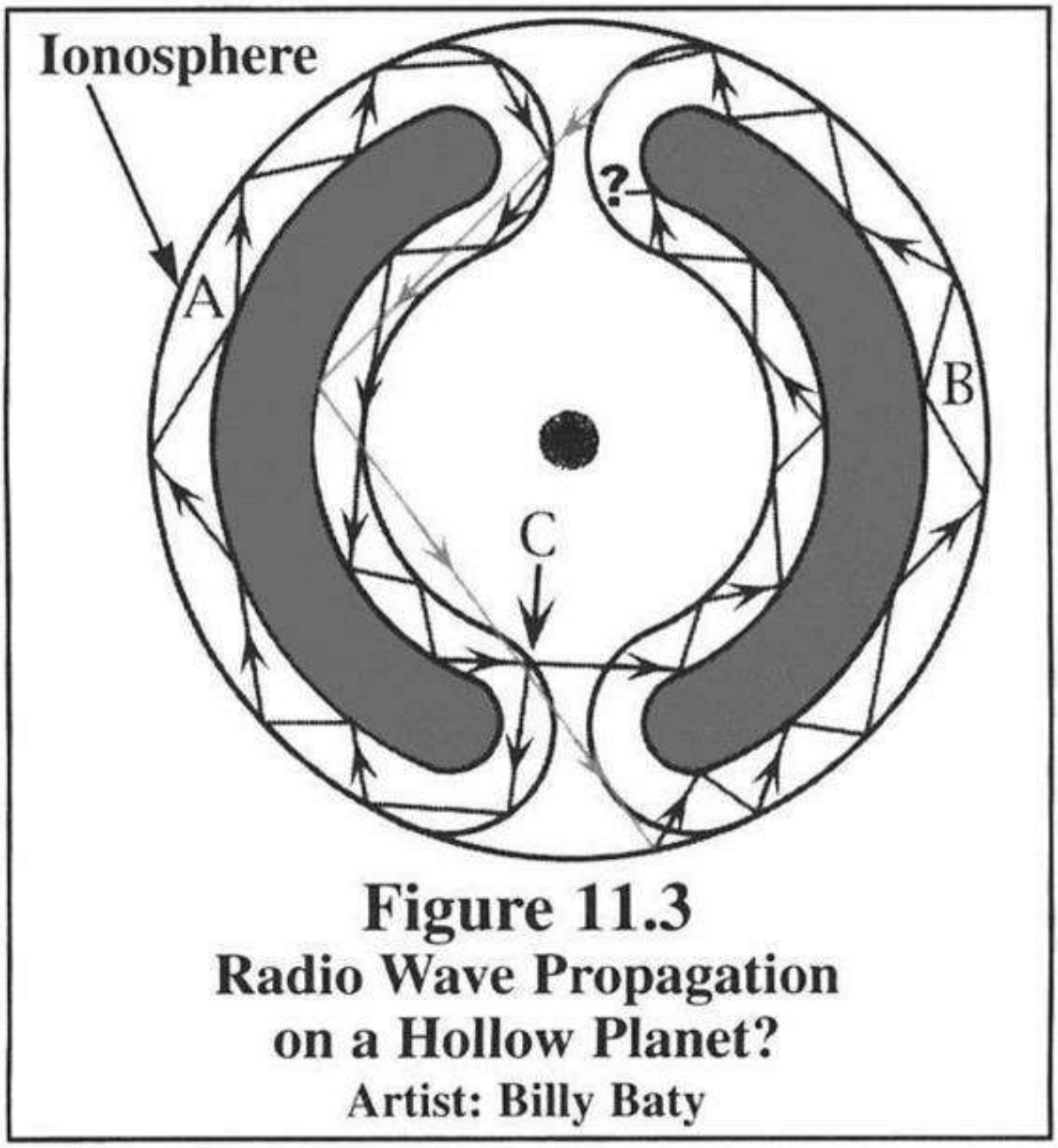

Figure 11.3
Radio Wave Propagation on a Hollow Planet?
Artist: Billy Baty

The radio waves may follow multiple paths. For example, at point C only a few waves might actually escape from the inner Earth. Others may bounce around inside the planet and continue to do so until they gradually fade away.

Another possibility is that perhaps there is no ionosphere inside a Hollow Planet. Perhaps radio waves, like those from B, might simply bounce from side to side inside the hollow cavity until some of them are fortunate enough to make it back out again back to point B thereby creating an LDE?

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(These are drawn as dark grey lines.)

These are just rough suggestions. What struck me was that the distance travelled by a wave in situation A seemed similar to the distance taken by a wave going around the outer Earth. Since most but not all, LDE's have times which are multiples of 138 ms, it would seem to me that perhaps one can infer some kind of inner Earth ionosphere. Consider those LDE's whose times are not multiples of 138 ms. How does one explain those in a solid Earth scenario? Wouldn't they be more easily explained by something akin to path B, where they do some strange bouncing around inside a Hollow Planet? (through holes in an inner Earth ionosphere?)

These are all very rough thoughts just to show the Reader that LDEs could possibly be explained by having radio waves bounce into and out of a Hollow Planet. And, from what I can tell, the distances (for option A) would closely match the periodicities which have been discovered. Of course the Reader should remember that 138 ms does not correspond exactly to the Earth's diameter on the outside. The speed of light is so tremendously fast that one would have to be able to measure LDE times down to many fractions of a second before one could really get any idea whether they perhaps bounced around the outside of the Earth or whether they actually entered it. This might be something worth doing in the future by someone who wishes to experiment further along these lines.

The Hollow Earth model could also produce the multiple echoes which have been noted by some scientists. Some radio waves may move around the outside of the Earth while some go inside and later emerge. All manner of variations could result from radio waves bouncing around the outside and inside of a Hollow Planet.

POLAR RADIO BLACKOUTS

The polar atmosphere experiences short wave radio blackouts for periods of several days at a time. The reason for this is that the ion concentration in the D Region increases (or so it is thought). This causes the D Region to become highly absorbing to radio waves which then causes radio blackouts. An article in the *New Scientist* in 1968 pointed out the following problem with polar blackouts:

> . . . the D region, becomes highly absorbing to radio waves, **a**

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> **phenomenon which can be accounted for by an increase in the ion concentration of the region during the hours of darkness. Normally, the ionizing radiation of the Sun increases ion concentration in daylight, so the reverse process is something of a puzzle.**[15]

The problem is that polar blackouts continue through the night time and the only explanation which can be suggested is the presence of excess ions. But as the *New Scientist* points out, where does this ionized material come from during the night? As Prof. Neil Davis mentioned, under normal conditions the amount of ions on the night side is 1/10th of that on the day side. As Davis mentioned, the D Region is denser than the E and F regions, and collisions between atoms are quite common. So any ions found in the D Region will soon combine with other atoms—i.e. they cannot remain as ions for very long. The problem is that for polar blackouts to continue through the night there needs to be new ions flowing into the night sky in the polar regions. This must continue through the night, for several days on end. But since some ions are produced by cosmic rays from the Sun striking the day side of the Earth, the question is: Where do the ions come from which cause polar radio blackouts? They can't be coming from the Sun. So where do they originate? As the *New Scientist* article states: ". . . so the reverse process is something of a puzzle."

Or could it be that sometimes, winds from the inner Earth blow outwards bringing with them ions from inside our planet? Perhaps such winds continue for a few days thereby causing polar radio blackouts? This particular issue of the anomalous ions which are sometimes found on the night side of the polar regions may be connected to the problem of Danjon's law which was mentioned earlier. Both these phenomenon suggest the presence of some kind of nuclear Inner Sun.

Could it be that some of the mysterious radio phenomenon on our planet are the result of our little world being hollow?

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Chapter 12: Strange Meteorology

If the Earth is hollow how would that affect the science of meteorology? It was a question which went through my mind in the early days of my study as I vaguely pondered the subject.

One of the first things which came to mind were the problems with weather prediction. Modern meteorology is based on complex mathematical algorithms which are programmed into powerful computers. Using these algorithms meteorologists predict the weather for tomorrow or later this week or beyond. The calculations are complex and numerous. Ever faster computers are doing more complex calculations to improve the accuracy of the weather bureaus around the world. Super-computers have been roped in to perform the billions of calculations necessary to produce tomorrow's weather report. Yet somehow the weather remains something of a mystery. We just cannot predict the weather more than a week in advance. Every day the meteorologists have to feed new data into the computers otherwise the results of their previous calculations will just be more and more inaccurate. In spite of having satellites covering the Earth from all angles 24 hrs a day, and in spite of accurate up-to-date measurements, the weather can never be calculated accurately for more than short periods of time. Why?

In the early 1970s Edward N. Lorenz, a meteorologist from the Massachusetts Institute of Technology engaged in an interesting study in a field now known as "Chaos theory." Lorenz posed the question: Can the flap of a butterfly's wings over Brazil spawn a tornado over Texas? The butterfly effect, as it has come to be called, has been studied mathematically and it poses major problems for weather prediction. It states that very small changes in the starting conditions of a model will result in very big changes later. Effectively, it places a limit on the number of days into the future one can predict the weather.

It is thoughts such as these which have led to Chaos theory. Chaos theory states that extremely small changes at the atomic level can affect the world in a big way. Chaos theory is thus used to inform us that there is a limit as to how well one can predict the weather. Scientists now believe that we will never be able to predict the weather more than a few weeks into the future. "Never" is a dangerous word to use in science! It has been proven

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wrong too many times.

I wondered whether indeed Chaos theory is the only valid answer to the weather prediction problem? What if there's something else at work too, bedeviling meteorologists? What if there is a tunnel connecting the inner and outer Earth? And what if air were to flow into and out of the inner cavity? Would that not mess up all those finely honed calculations done on those super-computers? Could an entrance into a hollow world perhaps cause mathematical meteorological chaos? Even if such a tunnel were very much smaller than the one on Venus one would still have a problem.

The extent of the chaos depends on the amount of air flowing in to and out of the inner cavity. It depends on the position and size of any polar entrance into the inner Earth. I would personally suspect that sudden flows of air into and out of the planet would change the air pressure. The temperature of the air flowing into and out of the planet may result in heat either being absorbed or added into the air on the outside of the planet. All this would mess up the accuracy of those calculations.

It is often stated by scientists that the world's weather is actually manufactured at the South Pole. What if a Polar Hole exists somewhere near the South Pole which is indeed responsible for some of this? The polar regions may therefore affect our weather more than we can know. Perhaps a better understanding of this would lead to better weather prediction? Those were some of my initial thoughts regarding this idea of Hollow Planets.

SUPER-ROTATION OF THE UPPER ATMOSPHERE

The Reader is now familiar with Venusian meteorology, especially the problem of the super-rotation of its upper atmosphere. Earth and Venus are similar in size, and in position in the solar system. Beyond that, they have little in common—or so it seems. There may be some surprising similarities between the meteorology of these two planets. We begin with super-rotation. In 1974, in *Nature*, David Hughes wrote:

> Observations of small changes in the orbital inclinations of artificial satellites have shown that the Earth's upper atmosphere (at altitudes of 150–400 km) is rotating about 20–30% faster than the Earth itself. This phenomena has become known as super-rotation. Even though it was discovered by King–Hele in the early 1960s, the cause of this 100 m s^{-1}

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west to east wind is still a subject of considerable debate.

Hughes went on to state that the super-rotation of the Earth affected the average satellite's orbit by about 0.1° during its life time. Since the effect is so small it is difficult to monitor the short term behavior of the super-rotating atmosphere. Hughes said that there is no evidence to suggest that the super-rotation of the atmosphere is linked to the 11 year solar cycle. He did note that these winds seem to be at their fastest at about 2100–2400 local time.

Remember that no one knows why the Venusian atmosphere super-rotates. Hughes theorized about some of the possible causes of super-rotation and ended up discounting them all. His first suggestion was a complex one to do with heating in the atmosphere by solar ionizing radiation and bombardment by charged particles. He theorized that perhaps this could cause a horizontal pressure which was controlled in part by the motion of ions in the F Region of the ionosphere. Hughes ends up shooting down this theory for the following reasons:

> . . . A problem with this theory is that heating of the auroral zone, which takes place during magnetic disturbances, can reverse the mean meridional pressure gradient. This would cause a drastic change in the super-rotation, a change which has not been observed.

He then examines another theory. This one being that electric currents in the F Region begin moving the charged particles. An electric field directed towards the equator could theoretically produce the super-rotation. He goes on to state that such electric fields have been observed at high northern latitudes. The effects produced by these electric fields should be enhanced during magnetic disturbances. He then discards this idea by noting that: "The effect [of the electric field], should, however, be enhanced during magnetic disturbances. **This is contrary to observations."**

So he examines another theory. He tries the "moving flame effect." He points out that when a heat source acts on a fluid it produces a convection current. Since the Sun moves in a westerly direction with respect to the Earth, he suggests that the convection cells tilt, producing a net horizontal flow of air. But he decides to drop this idea because calculations show that ". . . Permissible values of such parameters in the case of the Earth's atmosphere unfortunately yield inappreciable amounts of super-rotation." In other words,

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while the idea is sound the calculations show that the effect is far too small to account for the atmosphere's super-rotation.

He examines another idea. This one is that atmospheric waves might impart some momentum to the F Region. He then mentions the Scott effect which might also produce super-rotation. This is when a small brass cylinder is suspended in a cylindrical vessel containing a low pressure gas. A combination of a vertical magnetic field and a temperature difference between the cylinder and the vessel will cause the cylinder to turn. Perhaps, he wonders, something similar might be happening in the atmosphere? (Kindly note that the Venusian atmosphere super-rotates even though it supposedly has no intrinsic magnetic field.) Regarding all the above ideas, Hughes says: "At present it seems that none of these theories can explain the phenomena of super-rotation completely."

He goes on to examine a new theory. Ved Mitra of the Physics Department of MNR Engineering College, Allahabad, India presented this new theory in an edition of *Planetary and Space Science* [22,559; 1974]. He proposed that super-rotation is caused by small meteors and interplanetary dust particles which are striking the Earth. Mitra stated that this matter has a greater angular momentum than the Earth. So when it strikes the Earth, it imparts momentum to its upper atmosphere thereby creating this super-rotation.

Hughes points out two problems with Mitra's theory. Firstly he disagrees with the size of the particles on which Mitra bases his theory. This does not tie up with other studies. His second point is that he disagrees with the height at which these particles decelerate in the atmosphere. Hughes points out that:

> . . . This is contrary to visual and radar observations of the more massive meteoroids which have maximum ablation at heights of about 90 km.

As with the other theories, Hughes concludes:

> It seems therefore that the cause of super-rotation still remains a mystery and that the Earth's spinning upper atmosphere is still the happy hunting ground for new theories.[1]

The super-rotation of the Earth's atmosphere is nowhere near as great as the effect which occurs on Venus. If the Venusian super-rotation can be

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explained by way of a Hollow Planet with very large Polar Holes, I wonder if the same is not true for the Earth? The lesser super-rotation on the Earth suggests to me that the Polar Holes here on Earth may be smaller. This is something to keep in mind. The principle of the "pumping-action" which I suggested for Venus might apply here on Earth. The faster rotation of the Earth may also result in an atmosphere which has far more energy and which overrides a large part of the effect of the super-rotation.

Let me point out too, that the jet stream circles the Earth's polar regions. The jet stream is a very powerful "river" of air which also super-rotates about the Earth. Could it be that the jet stream derives some of its power from air flowing into and out of a Hollow Earth?

THE AURORA AND WEATHER

Current auroral theory contends that the aurora is only caused by charged particles from the Sun. These particles strike the atmosphere so high up, where it is almost a vacuum, that there is no possible way that these particles can influence the weather. There just is not enough energy contained in these particles, and the physical means simply does not exist whereby that energy can be transformed into clouds, weather or thunderstorms.

To confirm this scientific view I asked Prof. Davis whether perhaps auroral particles could create some kind of mist high up in the atmosphere—or have any other effect on the weather. Davis said that there was some excitement among scientists that there might be a link between global warming and solar output. However, as regards a direct connection between the aurora and weather he replied as follows:

> . . . The energy involved in the aurora is so small relative to the energy in sunlight that, at best, incoming auroral energy can act only as a trigger if it has any effect at all on weather.
>
> As to the clouds, the answer can be more definite because it has been documented that the energy associated with the aurora does have an impact on noctilucent clouds, a very special kind of icy cloud seen mainly at high latitudes and which is too high (about 80 km) to be involved in weather. When the aurora comes out the clouds have been observed to dissipate—it seems because the aurora is warming up the high atmosphere where the noctilucent clouds reside. . . The aurora isn't

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> creating any mist that might be clouds, at least clouds in the normal sense that are low-altitude and are involved in the weather. Interesting new stuff though on lightning between thunderclouds and the ionosphere. One of my friends here, Eugene Wescott, has been doing work on that, and it may lead to interesting results on the aurora-weather connection.

Noctilucent clouds are extremely high up and are something of a mystery themselves. But noctilucent clouds are not relevant to the question I was asking, as Prof. Davis himself stated. So at this point there really is no connection between weather and the aurora. As Davis stated, at best, the aurora and those particles might be a trigger. Even so, we have no idea how this would work.

I wondered whether perhaps there could be a connection between a Hollow Earth, the aurora and the weather? In a solid Earth scenario, the Earth's core lies thousands of miles away, beneath billions of tons of rock. There is no direct link between the Earth's core and the outer surface. However, in a Hollow Planet scenario, one where a planet has Polar Holes, there is indeed a direct link between the "core" (Inner Sun) and the outer atmosphere. Hence a link between the magnetic field and the weather seems to be a rather natural expectation—whereas on a solid Earth it is a virtual impossibility.

All of this is linked to the possibility of Polar Holes in the arctic regions. This is a question which eventually becomes very important in considering whether the Earth is hollow. Could winds blow directly into and out of the Earth? Can an Inner Sun somehow affect weather here on the surface directly—perhaps by way of an inner atmosphere which is linked to an outer atmosphere?

In the regions where the aurora is seen there is often a belief among the inhabitants of some link between the aurora and the weather. Generally, scientists mock this idea because it flies in the face of auroral theory. However, there does exist some evidence of a weak, yet physical link between the aurora and the weather.

Prof. Davis tells us that: "The Creek Indians of Georgia and Alabama and the Cheyenne Indians of Wyoming believed that the occurrence of the aurora meant the weather would change. The Penobscot Indians of Maine said the aurora would bring a windy day. If the aurora flickers, the wind will

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be strong and steady, and if the aurora is steady and quiet, the wind will be gusty. . . Another Lapp view is that the aurora is but a wintertime version of summer's thunderstorms, and useful for night travel across the snow."[2]

In 1965, C. M. Botley wrote about the possible correlation between the weather and the aurora. He described the beliefs of peoples living in the auroral zones. He noted that most of these beliefs were confused and contradictory, yet some of them seemed to be the result of sound observation. For example, the Finns referred to the aurora as the "vindlys" which means wind-light; while Scottish farmers of the last century believed that the first great storm of the year was always heralded by an aurora. Observations at Uckfield in Sussex during the aurorally "rich period" of 1843–70 showed that very stormy weather normally followed 10–14 days after brilliant auroral displays. The Southern Cross Expedition to Antarctica wintered at Cape Adare (72° S). During 1899–1900 they found that a violent storm would often follow from the south east whenever a brilliant and active aurora had been seen to the north. This happened too often to be mere coincidence.[3]

Scientists doubt that such a relationship can exist because there is no known mechanism which can account for this. Prof. Davis is open-minded. Even so, he expresses various doubts. He writes:

> Their anecdotal experiences of seeing aurora have led some northerners to believe that a causal relationship exists between low outdoor temperature and the occurrence of aurora. However, the relationship noted is simply because. . . it is possible to see aurora only when the sky is clear, and when the sky is clear, outdoor temperatures are typically lower than when the sky is cloudy. **The observation is correct**, **but the conclusion wrong. As yet**, **scientists have not found conclusive proof of any direct connection between weather and the appearance of aurora and related solar-terrestrial phenomena**.[4]

Davis explains that there is a statistical relationship between sunspots and the aurora. In recent decades satellite evidence strongly suggests that solar output also varies in accordance with sunspot activity. Since solar output also drives the Earth's weather, it becomes extremely difficult for scientists to determine whether there is a connection between the aurora and the weather. This is because both the aurora and the weather are largely controlled by the same thing—the Sun. But Davis does not totally rule out a connection:

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> On the other hand a few studies and observations do hint at a connection."[5] [He continues] If continuing measurements bear out the apparent relationship between solar light output and sunspot activity, then proof of a direct connection between aurora and weather may be difficult to determine. . . **One recourse is to look for possible short-term connections between aurorally related phenomena and weather patterns**.[6]

He elaborates:

> . . .**one study conducted some years ago gave at least minor evidence that storms initiated in the north Pacific during magnetic storms (times of major auroral displays) tended to grow more than those developing at other times.** Substantiation of this result is required before awarding it too much credence; however, the idea that auroral phenomena might have some triggering effect on storm development is reasonable. Certainly it is known that the aurorally related phenomena do heat the high atmosphere and enhance its circulation in the polar regions. **The energy involved is relatively minor compared to that involved in primary weather processes**, **so nothing more than a tickling of other processes seems possible**.[7]

He says that the energy involved in the aurora is too little to drive full-blown storms. He suggests that there may be a "trigger mechanism."

The Reader may wonder why the connection between the aurora and the weather is of interest to me. I wondered whether certain "impossible" weather connections could be better explained by invoking Hollow Planet theory? The aurora is generally accepted as being a high-level phenomenon which occurs in a virtual vacuum I have mentioned the possible existence of low-level auroras and auroral sound which suggests other factors are at work like electricity for example. This electricity might be generated inside the Earth. The weather connection is even more important since one needs to somehow link the Earth's core with the lower atmosphere here on the outside of the Earth. The only way I can see this as a viable possibility is if there is a hole in the crust of a Hollow Earth which allows air to flow into and out of the planet. Perhaps a mechanism exists whereby a central Sun could flare up and cause a pressure wave which travels all the way from the inside of the planet

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to the outside? What if a central Sun were to bend magnetic lines of force on the outside of the Earth, thereby triggering an aurora while at the same time triggering a powerful pressure wave of air which would slowly travel to the outer atmosphere? Thus one would first see an aurora and then some time later (hours or days later), the physical pressure wave might arrive? Consider the following evidence.

In 1837, W. B. Clarke wrote that aurorae are often followed by wind and rain.[8] In 1872 W. F. Denning noted that major auroral displays were followed by a gale within 48 hrs. Does this 48 hr time delay perhaps only apply to the British Isles?[9] In 1873, W. R. Birt noted that thunderstorms and aurorae seem to wax and wane together.[10] In 1963, a paper in the *Journal of the British Astronomical Association* noted that records from the great 19th century Arctic expeditions contain many accounts of "clouds" becoming aurorae after nightfall. These same aurorae then turned into "clouds" at dawn. A. Paulsen regarded the presence of these clouds as being an indicator of daylight aurorae. Some have expressed the opinion that the aurora is a material object which produces luminous clouds at night, while the white cloud in the day time is an aerosol formed in the ionosphere. Indeed, the second Franklin expedition (1826–7) noted that a haziness would develop around active aurorae.[11]

In England on the evening of 11 Oct 1903, the aurora disappeared after a fairly active display. Its place was taken by a system of narrow bands of cirrus clouds which stretched right across the sky. The Moon's light made the clouds look like an aurora.

> That they did not form part of the aurora could only be decided at first owing to no line appearing in the spectroscope when pointed at them; but later there could be no doubt, as they partly obscured the Moon.[12]

This observation by a scientist with a spectroscope must surely be considered very strange. Could part of the aurora turn into a cloud or produce some kind of cloud?

Back in 1892, M. A. Veeder made a most remarkable observation. He noted that during the previous September there had been numerous large sunspots. However, during that month the auroras were very weak. He wrote:

> . . . In this case certainly large sunspots have not been attended by bright

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> auroras, as some have held to be the rule. The explanation of this anomaly, which appears to be justified by systematic records in my possession, is that thunderstorms took the place of auroras. It has been found that not unfrequently thunderstorms become widely prevalent upon dates upon which auroras should fall in accordance with their periodicity corresponding to the time of a synodic revolution of the Sun.

He postulated that somehow the thunderstorms would rob the aurora of its brightness. He observed that aurora and thunderstorms might be substitutive due to some means yet unknown.[13]

In 1980 D. J. Southwood reported in *Nature* that some researchers had tried to find a link between the aurora and the weather. A number of scientists had speculated that if there is a link then it must surely be electrical. He stated that if there is a link between auroral activity in the very rarefied outer layers of the atmosphere and in the troposphere below it then it would have to be subtle. The two regions are very different and a direct link is hard to find.

Southwood pointed to an interesting experiment which took place in Canada where a balloon was released into the atmosphere by scientists during an auroral sub-storm while a nearby thunderstorm also in progress. [Bering *et al, Journal of Geophysical Research,* 85:55, 1980]

The researchers had used various instruments on the balloon to measure vertical and horizontal electric fields and conductivity as well as X-ray emissions. They tried to find a correlation between lightning flashes below and electron bursts in the ionosphere above. Thunderstorms are a strong source of AC signals in the atmosphere. It is thought that these can penetrate effectively upwards through the atmosphere. In the 1–30 kHz VLF band lighting has been found to produce whistler mode plasma waves in the magnetosphere. Bering *et al.*found that 62 out of 95 nearby lighting flashes were followed within 1.5 seconds by electron bursts in the ionosphere. Bering *et al.*estimated that there was a probability of only 1% that this could have occurred by chance.

On the other hand, their measurements of the local electrical conductivity showed it to be half of its fair weather value. Southwood regarded this as a blow to the idea that the link between thunderstorms and the aurora. However as I see it, it only seems to be a blow to the theory that the link may be electrical in nature. Either way, there is still a strong suggestion in the results that these totally disparate mechanisms are related.[14]

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In 1853 W. Stevenson commented upon the possible link between aurorae and clouds. He stated that cirrostrati clouds resemble cirri in their tendency to arrange themselves into long parallel bands. But cirrostrati are not composed of ice-crystals. He commented that:

> . . .they appear frequently as concomitants of the aurora, so much so as to leave no doubt of a connecting influence between them and that phenomenon.

He pointed out that cirrostrati and cirri were decidedly luminous at night and that the luminosity of the dark cirrostratus bands was nearly equal to that of the faint aurora.[15] I would like to draw the Reader's attention to the above mention of clouds which form in long parallel bands.

In 1920, W. Ellison wrote about some similar observations of his own during the years 1895–1900, when he was on the Durham coast. On a number of occasions he had noticed that slight displays of the aurora seemed to be associated with a certain form of cirrostratus cloud. One evening he had watched from Sunderland as curved auroral streamers shot up into the northern sky in pairs, with each pair enclosing a lens-shaped space of clear sky. Within seconds a cloud would form in the enclosed space. This cloud would persist long after the streamers had faded. This happened several times in the course of two hours. Ellison concluded that ". . . there could be no doubt about the association between the luminous bands and the cloud.[16]

Baron von Wrangel had made the following observations while in Siberia:

> When the streamers extend to the zenith or nearly so, they sometimes resolve themselves into small luminous and cloud-like patches of milk white color, which not infrequently continue to be visible on the following day in the shape of white, wave-like clouds.[17]

In the latter part of the 19th century, several European observers had noted that stars seem to twinkle mainly during auroras. They thought that this possibly indicated the presence of physical matter in the sky (caused by the aurora.)[18]

John Slatter wrote this in 1898:

> An old friend of mine told me 40 years ago that a relation of his, who

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> commanded for 2 or 3 years a cruiser in the channel had observed that whenever an aurora appeared the wind would blow hard from the southwest in 48 hrs. I have myself verified this as the unfailing result of my own observation ever since.[19]

Note the time delay of two days. This suggests that the aurora which is seen immediately, is somehow linked to a physical event somewhere far away. The aurora is visible immediately, but the consequences of it take several days to travel the same distance to the observer.

In the early 1970s Walter Orr Roberts, president of the University Corporation of Atmospheric Research and Roger H. Olson, an Environmental Data Service research meteorologist with NOAA investigated the possibility of a relationship between weather and the aurora in the Gulf of Alaska. They:

> . . . appear to have confirmed a statistical relationship between the behavior of certain atmospheric features over the Gulf of Alaska and geomagnetic storms. Apparently, low-pressure troughs found at the 300 millibar level tend to intensify or deepen, in response to storms in the geomagnetic field, which are marked by displays of auroras. One-third of the troughs over the Gulf of Alaska eventually move into the central USA. It was concluded that those [troughs] preceded by northern lights penetrate about 200 mi farther south, and bring cooler weather with them. Although not all large troughs are triggered by northern lights and not all auroras are followed by trough development, the probability of the trough's intensifying seems to be approximately doubled by the occurrence of a magnetic storm. . . Still, the results of the entire study are perplexing to the scientists because there is no proven physical explanation for them.[20]

Various long-winded and vague ideas were put forth to try to explain the phenomenon. Nevertheless, the results are "perplexing" to scientists because there is no proven physical explanation for this. Magnetic forces are too weak to affect the weather. Atmospheric pressure could not possibly be affected by charged particles from the Sun striking the ionosphere alone—it's virtually a vacuum up there. The above study suggests that there is a correlation between geomagnetic storms, the aurora and storms and atmospheric pressure. These correlations make no sense at all—except perhaps, if our planet is hollow.

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For example, could pressure-waves generated inside the Earth, even relatively weak ones, sometimes have effects on the surface? Could weak pressure waves have a slight statistical effect on these storms? Could winds bearing disassociated atoms from inside the Earth somehow be a part of the key?

As can be seen from the above, many observers have noted a possible link between storms, winds and clouds—all possibly related to the aurora. All of these observations are impossible in the light of modern-day auroral theory.

Which is the cause and which is the effect? Generally scientists say there is no correlation between the aurora and the weather. Generally, I see no problem with that statement. However, there is a small percentage of correlations which nevertheless are too consistent to ignore. These seem to indicate that sometimes, there is a correlation—a totally impossible correlation which defies the laws of chance. This suggests to me, that perhaps some kind of pressure wave is generated inside the Earth. These waves may often be too weak to have any noticeable effect on the Earth's outer atmosphere. The general nature of this phenomenon seems to resemble some kind of rush of air from inside the Earth.

Some of the resultant atmospheric phenomenon may help to give us a clue to the nature of the atmosphere inside the Earth. As a whole, one would expect the atmosphere to be similar because of billions of years of atmospheric interchange. However, that atmosphere might contain many ionized atoms. In the next section we will see more possible evidence of the direct expulsion of air from inside the Earth.

POLAR BANDS

Earlier there was mention of some cirri and cirrostrati clouds which seemed to have a tendency to arrange themselves into long parallel lines. It has been observed that cirrus clouds sometimes align themselves along the magnetic meridian (i.e. pointing to the north magnetic pole.) These clouds form long sharply defined parallel streaks. A ground observer would see these parallel clouds as fanning out from a point on the northern or southern horizon. However, this is merely an illusion for these clouds form perfectly parallel bands. When they are overhead, these bands are evenly spaced. Sometimes these clouds are faintly luminous at night too. Von Humboldt

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called them “polar bands.” English folklore refers to them as “wind reels.” Early observers believed that they were associated with the aurora. Polar bands are often aligned along the magnetic meridian.

During my study I wondered whether these particular clouds originated from inside the Earth. Could these parallel lines of cloud be associated with some form of compression and decompression of air containing water vapor as it passed through a Polar Hole?

In England, on 30 Oct 1870, a film of cirrus stratus cloud radiated in most beautiful and symmetrical manner from a point below the northwest horizon. They resembled the streamers of the aurora. At 1300 on that day, long ridges of cumuli were arranged in a similar manner.[21] Why were these clouds aligned in a northwest direction? From England, northwest, along a great circle route takes you in the direction of southern Greenland and on to the north magnetic pole in Canada.

On 8 and 9 Apr 1871, long streaks of cirrus stratus clouds were seen from England stretching in a northwest to south-east line. On 9 April, there were auroral streamers parallel to the cloud display.[22] The clouds were parallel—however as they extend to the horizon it appears as if they are converging because of their distance from the observer. The fact that the clouds later extended and converged in the southwest implies that the clouds were actually moving from north to south and remain parallel to each other. It is not merely a case of the clouds being aligned with the magnetic meridian, but that the clouds were moving away from the magnetic meridian.

On 10 Apr 1872, at Champion Hill in England, cirrus clouds were seen radiating from magnetic north. It was followed by an aurora.[23] On 18 June, 1872, in England, masses of cirrus cumulus clouds were polarized almost along the magnetic meridian.[24] On 23 Oct 1872, in England, polarized streaks of haze and cirrus clouds were seen. A similar occurrence was seen again on 11 and 12 Sept 1873.[25]

A number of gauze-like white clouds, forming perfectly straight lines radiated like a huge fan from a point due north of Harefield, England, on 12 Mar 1900. The clouds formed straight white streaks. These streaks were evenly spaced. There were 24 of these streaks above the horizon. The observer, Jemina Sigma made the following comment: “. . . and what struck me as most singular, they all ended almost abruptly. Why would the clouds end so abruptly?

The reverse instance seems to have occurred on 2 Oct 1921 in England.

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At 2012 a fan-shaped white cloud radiated from south-southeast. It turned into streamers with dark spaces between them. As the clouds moved to west of north, the stars shone through them. As the clouds sank in the north they had the appearance of auroral lights. Cook commented:

> . . . These long parallel clouds with clear sky spaces between have been seen on many occasions and always moving to or from north. They move very slowly and seem to be at a higher level than ordinary clouds.[26]

Is this particular instance related to electricity causing the clouds to take on the appearance of the aurora? Also of possible importance is that these clouds seem to be far higher than normal. Cook also relates an instance at Stowmarket, England in 1920 where curious bands of clouds radiated from magnetic north and converged on the south-southeast horizon.[27]

On 25 Jan 1926, a ship in the Indian Ocean saw cirrus streaks radiating from a point bearing 45°.[28] Unfortunately I do not know the position of the ship at the time this sighting was made. A bearing of 45° from north would be northeast. The North Magnetic Pole is approximately northeast of the central Indian Ocean.

T. A. Sergeant on the *S.S. Nagoya* saw a remarkable cloud formation consisting of radiating streaks of cirrus cloud off Cape Garde at about 0530. (See Figure 12.1.) The streaks were completely evenly spaced arcs terminating approximately at true north and south. It gave the sky a domed appearance and lasted until after sunrise at 0645. The formation gradually broke up merging into Alto Stratus.[29] Just before sunrise on 20 Mar 1932, at Oxford, England, a band of cirrus 5° wide spanned the heavens north to south. It was a brilliant pink color.

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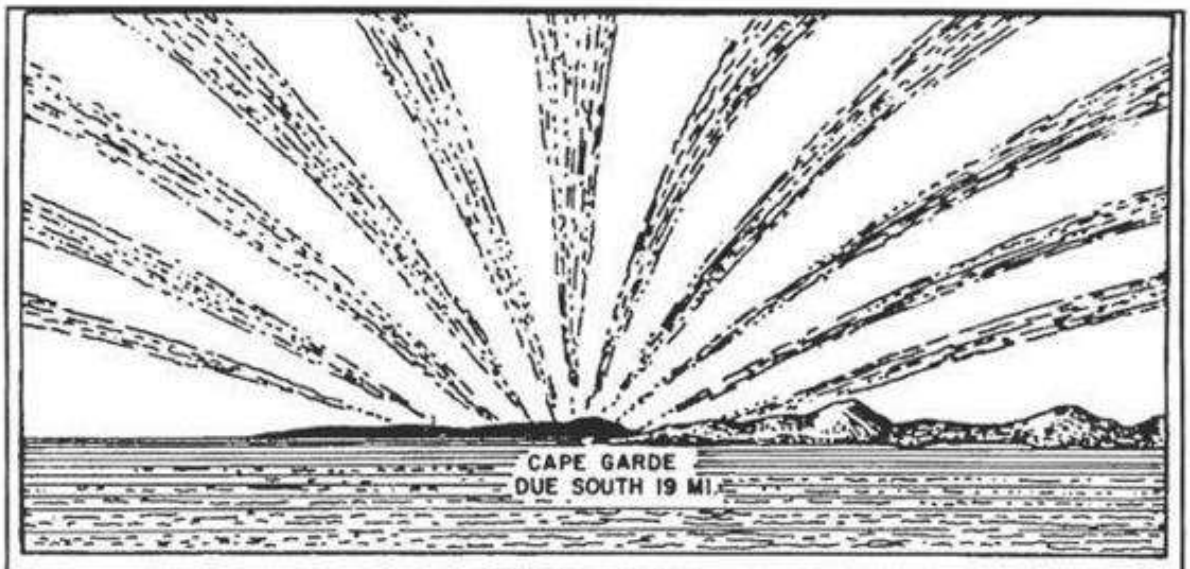

Figure 12.1

Polar bands over the Mediterranean Crown copyright is reproduced with the permission of the Controller of Her Majesty's Stationery Office.

It is interesting to see the direction which the phenomenon takes when seen from different parts of the world. A similar phenomenon occurs in the southern hemisphere, but it seems to originate from the Antarctic. On 30 June 1925, cloud streamers were seen from East London, South Africa. They were radiating from the south.[30]

Stevenson noted back in 1853, that a study of cirrus bands observed from 1840–7 indicated that their alignment was most frequently along the magnetic meridian.[31] A contrary view was expressed later in 1928 by C. Talman in an American Meteorological Society bulletin. It was now believed that polar bands were not preferentially aligned along the magnetic meridian.[32]

We need to be careful of the above conclusions. If polar bands are related to winds which emerge from a hole in the crust of the Earth, it then depends on how close that hole is to the north magnetic or geomagnetic poles. It also depends on one's geographic location as to whether the polar bands appear to be magnetically aligned or not. The alignment of the clouds, as determined from England and Europe seems to suggest that it is aligned with the magnetic meridian. The conclusions drawn by C. Talman relate to North America, and the polar bands, when seen from that angle might not be

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aligned with the magnetic meridian.

In 1963, L. Kellner examined the problem again. Kellner noted that cirrus clouds often appear in a regular array of parallel bands. Alexander von Humboldt first discovered this during his meteorological observations in Siberia and South America. He noted that these arrays often seem to coincide with the geomagnetic meridian of the area. Kellner writes:

> Even very casual observations confirm the truth of his statement. He suspected some connexion between the appearance of these ‘polar bands’ and that of the aurora borealis. . . [Kellner goes on to suggest that the orientation might be due to ice crystals forming around meteoric dust which is often magnetic.][33]

A year later McDonald and Kellner question whether this explanation can really work:

> . . . meteoric dust has not been proven to be a nucleating agent for ice crystals. **Furthermore**, **the alignment of individual ice crystals would not explain the macroscopic structure of the polar bands; i.e. parallel streaks aligned with magnetic north**.[34]

The idea of magnetism being the cause of parallel streaks of cloud seems highly suspect. But then again what other options do scientists have when dealing with such a nonsensical situation? Stranger still are occurrences of luminous clouds at night, which also move in north-south bands in Figure 12.2.

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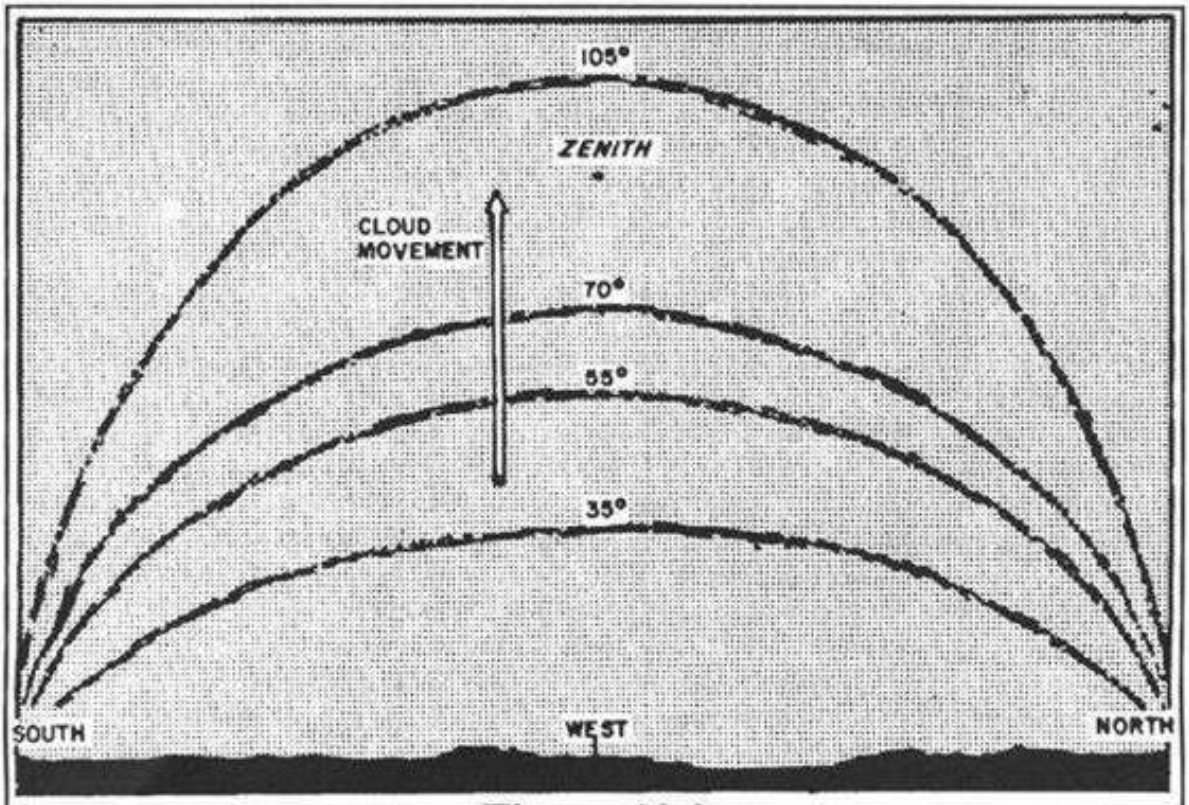

Figure 12.2

North-south cirrus streaks over England, 1933. Crown copyright is reproduced with the permission of the Controller of Her Majesty's Stationery Office.

On 24 July, 1933, a strange cloud formation was seen during the evening at Westcliff-on-Sea in Essex. At 2120 GMT a belt of cirrus cloud was seen stretching across the western sky at an elevation of 35°. It was orientated in a north-south direction. Soon a second belt appeared. Between 2120 to 2150 eight belts of cloud travelled across the sky from west to east. The eighth belt disappeared at 2150 at an elevation of 105°. None of the belts appeared from the west until they were at an elevation of 35°, possibly because the western sky was too bright, making the clouds difficult to see. All the belts were 1.5° in width. The clouds were whitish in appearance, with the lower three being very clear. The brightness of the belts was similar to that of the Milky Way on a clear moonless night. As each cloud reached an elevation of 70° and higher, stars could be seen through them, which means that they were very tenuous in nature.[35]

The above examples illustrate a number of interlinked facts which have

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no right to be linked—at least according to our science as it stands now. We find certain types of cloud emanating from north and northwest of England and Europe. Most of the data suggests that from the British Isles the point of origin lies somewhere in the vicinity of Greenland or beyond. As seen from South Africa, the clouds seem to originate more or less from the South Pole. As seen from the Indian Ocean the suggestion is a line lying towards the Alaska, or further on, somewhere in the vicinity of Greenland. From an American point of view one can conclude that these clouds do not seem to coincide with the magnetic meridian. So one has a phenomenon which coincides with the magnetic meridian most, but not all of the time. Also, there is no reasonable scientific explanation for:

1. The alignment
2. The parallel spacing
3. The movement to or from the magnetic/geomagnetic poles.
4. The manner in which the clouds start and stop abruptly.

Meteorologists expect the polar regions to produce a peculiar kind of weather by way of their geographical location and their low temperatures. However, these clouds do not emanate from the geographical poles.

In what manner can the Earth’s magnetic field generate clouds and propel them away from a central point in all directions—hundreds and even thousands of miles away? If these clouds emanated from the North or South Pole, one would be able to come up with some rationale for their existence, but they come from a spot which has no particular geographical or meteorological significance.

The main force of the magnetic field lies in its ability to affect the direction of a compass needle. How can such a weak force possibly drive the weather? How does the Earth’s magnetism create these long thin parallel clouds?

What of these strange luminous clouds seen over England in 1933? These clouds were spaced in parallel bands from north to south. Since their behavior is so similar to the day time polar bands it would seem that there is a connection. Alexander von Humboldt was certain that there was a connection between these day time clouds and auroral streamers. What makes them luminous? Or is it that perhaps there are ionized particles in the clouds which

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are recombining thereby causing a glow? (like a mild form of the Venusian "ashen light" phenomenon?) Thus one has the similarity to the aurora? Do such ionized particles originate from inside the Earth? Could this explain their luminosity?

These clouds were seen moving from west to east. These clouds were moving in the direction of the Earth's rotation. Were these clouds driven eastwards by the same wind-forces which drive the Earth's super-rotating atmosphere? Were they perhaps very high?

There is a further similarity between these English clouds and the aurora. The aurora undergoes a change known as "the auroral breakup," late at night, just prior to midnight. The luminous clouds were seen late in the evening at approximately the same time. Earlier this chapter I quoted from the paper in *Nature* by D. W. Hughes wherein he stated that super-rotation is at its maximum between 2100 and 2400 local time. This coincides with the auroral breakup times as well as with the luminous cloud at night. Could there be a physical link between these diverse phenomena?

WEATHER FROM INSIDE THE EARTH?

What happens when a scientist discovers a link so strange, so impossible that no one knows what to do with it? That happened to a climatologist by the name of Goesta Wollin. He discovered that freak storms in North America could be predicted with startling accuracy simply by watching the horizontal component of the Earth's magnetism. The problem with Wollin's discovery is that it is frankly impossible according to our current understanding of science.

When I tried to contact Wollin I was told that he had passed away in 1995. I did manage to find a Prof. William Ryan of Lamont–Doherty who had worked with him and who knew him well. In an e-mail dated 27 May 1997 told me this about Wollin:

> He co-authored many papers with Maurice Ewing, the founder and first director of Lamont–Doherty, so his reputation was highly respected.

I asked Prof. Ryan what other scientists thought of Wollin's discoveries. He replied:

> . . . At the time, his colleagues here did not base too much on his

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correlations, though they were intriguing. However, the *Science* paper received rigorous peer review.

More than 30 million people live in the Washington/Boston area. This area is subject to sudden blizzards which can paralyze cities and freeze people to death. Predicting these blizzards is very difficult. Wollin pointed out that seven USA Federal agencies were working with seventeen universities to try to gather enough data to improve the accuracy of computer based predictions. Their budget was $10 million. Wollin pointed out that they had ". . . made no practical progress towards forecasting the blizzards."

Wollin's first amazingly successful freak weather prediction had taken place in January 1986. He had asked Al Travis of the Fredericksburg Magnetic Observatory to report any sudden changes in the magnetic field to him. On 22 Jan 1986, Travis phoned him and told him that the instruments had shown a sudden jump in the horizontal component of the Earth's geomagnetic field. Wollin then told him that this meant a major snowstorm or flood would occur in six days. Wollin then phoned TV stations in the region telling them what he expected to happen. The weathermen countered by saying that there was nothing unusual forecast. Their satellite pictures and weather charts showed no indication of any impending storm. They turned down Wollin's requests to mention his prediction along with theirs.

A freak storm struck between 25–28 January. 100 mm of rain fell in the coastal region between Boston and Washington, D.C., while 40 in of snow fell inland. Goesta Wollin's prediction had come true. The storm caused considerable damage to property and several people were killed.

Wollin's research began back in the early 1970s when he searched for a link between the Earth's magnetism and temperature. He and David Ericson began to study climatic changes which have occurred since the last ice age, 11,000 years ago. Soon after they had finished plotting their temperature curves they stumbled upon an article in *Science* which showed how the Earth's magnetic field had changed during the same time period. Wollin studied the graph accompanying the article. He noticed that it bore a strange resemblance to his own. The very next day he realized what the connection was. The curves on his graph was a mirror image of the graph in *Science*. Where the one fell, the other rose, and vice versa. This meant that when the magnetic field was weak, the climate warmed up. When magnetism increased, the climate cooled. Wollin then met William Ryan, a research

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student who had been studying magnetism in seabed sediments from the Caribbean over the past 700,000 years. By chance Wollin and Ericson had based their climatic studies on samples from the same region. Ryan had found evidence of five magnetic reversals. Within a few months the three of them could demonstrate that there was a strong long-term link between the strength of the Earth's magnetic field and the Earth's temperature. They found this to be true not only for the Caribbean, but also for the Pacific and Mediterranean too.

The scientific response to Wollin's theory was mixed. While climatologists have in general supported it, geophysicists point out that Wollin was never able to show exactly how climate and magnetism were linked. Wollin's suggestion was that the answer lay in the Sun's magnetic field which affects that of the Earth. Other scientists have however pointed out that although a weak magnetic field on Earth would allow more radiation from space to penetrate to the ground, it would not be enough to account for the warming effect.

It was then that Wollin decided to try searching for short-term changes in the magnetic field. Could short-term changes in the magnetic field also affect climate? Wollin decided to analyze data on violent storms that had not been predicted. He wanted to see if such events could be linked to equally violent changes in the magnetic field. He discovered that on 7 Feb 1967 an unpredictable blizzard had dropped 35 cm of snow on New York city. The magnetic record showed that after a long period of calm there had been an abrupt change of 40 gamma in the magnetic field strength two and a half days prior to the blizzard. He studied the magnetic record for February 1983. On 4 Feb 1983 the magnetic recorder had oscillated wildly. Then there was a dip when another freak storm broke.

A similar event occurred in 1985. The sad events of October–November 1985 convinced Wollin that he really was on to something. A sudden storm had resulted in a flood which caused the deaths of 39 people. Wollin found that the magnetic trace for the two-and-a-half days leading up to this storm matched exactly that of the storm in 1967. This could not be a coincidence.

Wollin wanted to try to make an accurate prediction based on his theory. It was then that he elicited the help of Al Travis from the Fredericksburg Magnetic Observatory in Virginia. Travis was to keep an eye on the magnetic recorders and to alert Wollin if they started behaving erratically. Travis called Wollin on 22 Jan 1986 when the magnetometer recorded a sudden jump of 45

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gamma in the Earth's horizontal magnetic field component. As I mentioned earlier, this led to the successful prediction of a freak storm three days later.

Wollin and other scientists have made some very interesting discoveries regarding the weather in North America. Their discoveries are very strange indeed. Back in the 1950s Walter Orr Roberts discovered that there were changes in the pattern of air pressure at high latitudes following solar magnetic storms. Ralph Shapiro and Roger Olson of the National Center for Atmospheric Research in Boulder, Colorado found that winter storms in the Gulf of Alaska were more severe following solar magnetic disturbances. Scientists have found that solar magnetic storms tend to have a strong effect on the horizontal component of the Earth's magnetic field.

Computer models and theoretical calculations had shown that the atmosphere is at it's most sensitive to external influences in autumn. Wollin conducted an intensive study of weather and magnetism for months of October and November during the years 1970–5. He obtained weather data from stations at Fairbanks and Barrow in Alaska. He compared this with data from nearby magnetic observatories. He discovered a direct relationship between atmospheric pressure and magnetic field changes. A sudden change in the magnetic field resulted in a change in air pressure over Alaska 5 days later. This, according to our current scientific knowledge is of course impossible. He also discovered that that specific storms in North America could be traced back to specific magnetic events.[36] There has been a reluctance on the part of most scientists to accept this strange correlation. One can understand their attitude because on the face of it this correlation appears to be quite nonsensical.

Wollin's work on the long term links between magnetism and climate was impressive. In 1981, John Gribbin had high praise for Wollin in an article in the *New Scientist*. Gribbin pointed out that 300 years of direct measurement of geomagnetic and climate parameters result in some intriguing correlations. The same holds true for paleomagnetic and paleoclimatological data as long as one chooses the correct variables for comparison. In Figure 12.3 one can see the correlation between magnetic intensity and temperature over 400,000 years.

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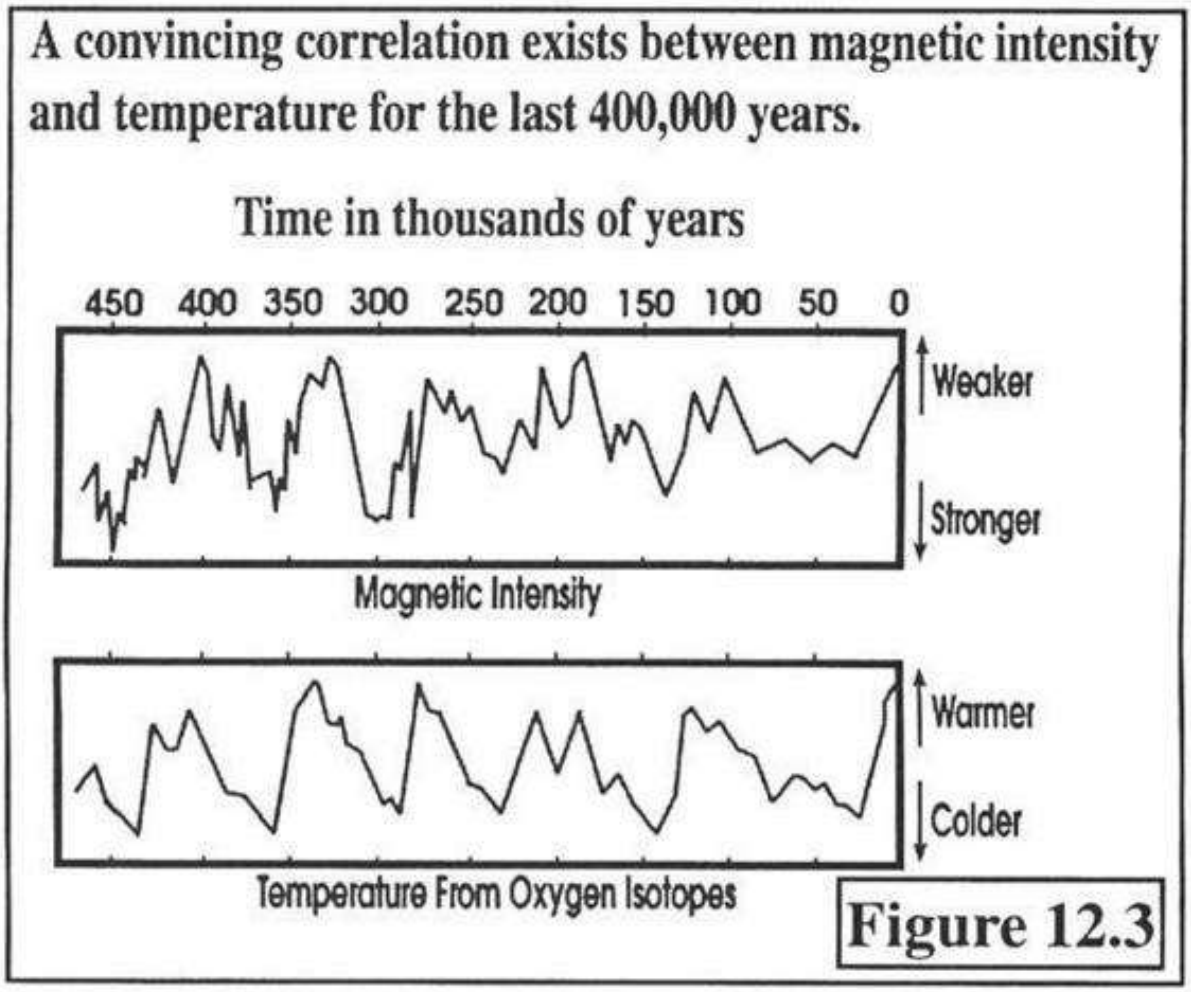
A convincing correlation exists between magnetic intensity and temperature for the last 400,000 years.
Time in thousands of years
450 400 350 300 250 200 150 100 50 0
Weaker
Stronger
Magnetic Intensity
Warmer
Colder
Temperature From Oxygen Isotopes
Figure 12.3

In the beginning Wollin's almost constant failure at correlating magnetic intensity with climate drove him to despair. A lesser man might have given up, but not Wollin. He discovered that the key correlation lay in the rate-of-change of magnetic intensity and the sea surface temperature. There was also a three-year time delay between increases in the rate-of-change of magnetic intensity and the subsequent changes in temperature.

It was thus supposed that magnetic changes affect the ionosphere. This was somehow coupled to the lower atmosphere and oceans which would cause a rise in the sea surface temperature. The resultant changes in sea surface temperature would take three years before it affected the climate.[37]

Wollin's short term predictions of freak storms were so successful that he could predict them without even looking at a weather map. Weather bureaus don't use Wollin's forecasting techniques of course. Not even Wollin really knew why it worked. Wollin had speculated that solar storms might

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affect the Earth's magnetic field by dumping energy into the oceans and then into the atmosphere. But this is all speculation because nobody really knows. John Gribbin, writing in *New Scientist* asked: "Will it [Wollin's predictive technique] work in Britain and the rest of Europe? Nobody knows because nobody has looked."[38]

I wish to emphasize that Wollin was not watching sunspots, nor was Wollin looking for solar flares to predict the weather. Wollin was instead watching a magnetometer. In other words, Wollin was watching what is happening inside the Earth as an indication of coming freak storms. Gribbin points out that Wollin himself did not know the answer. Gribbin is adamant that there is a long term connection between magnetism and the climate.

Although Wollin's ability to predict freak storms in North America appears to border on the fantastic we must not lose sight of a key element here. Wollin's study of Alaskan data showed that there was a constant relationship between magnetism and air pressure. There is a problem in using his techniques on a global scale. It would mean that global magnetic field changes would cause freak storms everywhere simultaneously. If this were the case then surely scientists would have noticed it by now? I would guess that Wollin's discovery is only valid for North America. Why?

What could the answer be? I find myself coming back to the possibility of a coupling between the activity of a central Sun and that of the Sun. Could it be that activity on the Sun communicates itself to a central Sun by way of the magnetic field? Could such a central Sun then flare up in sympathy by producing more heat as well as a sudden shock wave? This shock wave would then transmit itself from the center of the Earth to a region nearby on the outer surface. The magnetic effects will be virtually instantaneous but the shock wave itself will take several days to travel the several thousands of miles to the outer surface. This would explain the time delay which Wollin observed. That time delay was relatively fixed, thereby suggesting that a fixed distance is involved in the transmission of this shock wave. The key as Wollin observed was not the intensity of activity but its rate of change. This might indicate that freak weather storms are caused only by a sudden shock wave. A more gentle change in intensity would not produce an atmospheric shock wave. This would be consistent with the Alaskan weather data. It would mean that shock waves originating from the core of the Earth are capable of affecting Alaskan weather. Since it seems to affect Alaska, but not Europe or Britain, could we infer then, that a Polar Hole in the Earth's crust

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lies near Alaska?

Could it be that the water vapor in the air which caused the storms on the east coast actually originated inside an Inner Earth? It is worth noting that on 22 Jan 1986 there was absolutely no evidence whatsoever on the weather charts of an impending storm. Could that be because the factors which were about to cause the storm actually lay beneath the surface of the Earth at that time?

In the book *Weather* we read that: "Cold fronts usually advance at speeds of about 20 mph, faster in winter than in summer, because in winter the air is colder and exerts greater pressure."[39] Let us work with 20 mph even though it was winter time and the pressure and speed would probably have been greater. The actual storm took three days to arrive. A cold front travelling for 3 days at 20 mph would cover a distance of: 3 x 24 x 20 = 1,440 mi. Could this give us some indication of the distance travelled by a potential storm front from the Inner Earth to the east coast of the USA? Is it possible that the freak storm was generated from more than 1,500 mi away (at least)?

THE SWELLING ATMOSPHERE

With regard to Mercury we have discussed the possibility that an atmosphere inside a planet may flow out and back in again. With regard to Venus we have seen the various evidence for the rising and falling of the atmosphere across the planet. We have seen evidence suggesting that the planet's entire atmosphere could rise and fall by about 1 km. This "breathing" action seems to indicate that Venus is hollow. Is there any indication that the Earth's atmosphere rises and falls by considerable amounts? I would like to proffer the following tale as possible evidence to consider (showing again some of the startling similarities between Venus, Mercury and Earth.)

NASA launched its 77 ton Skylab space station on 14 May 1973 with a Saturn V booster. Disaster nearly struck at that early stage because one of the two solar panels was missing and the other failed to deploy. The workshop was thus without power. During the first few hours NASA ground controllers felt that the space station would overheat and would destroy the equipment inside the workshop. Skylab was the most sophisticated piece of space hardware of its time. It's space-borne computer was the first to have redundancy management software. By using the sophisticated onboard computer system they were able to keep the space craft at suitable angles to

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the Sun so that the temperatures were tolerable and the equipment could not be damaged. Meanwhile engineers prepared repair material on the ground so that the crew could make the necessary repairs. During that first year three successive crews engaged in very successful research. The systems were finally shut down on 9 February 1974 when the last crew left.

My interest in Skylab relates to the behavior of the Earth's atmosphere and the friction it exerted on the space station. NASA had expected Skylab to remain in orbit until the mid-1980s. By then the space shuttle would be operational and it had been expected that it would bring up rockets which could boost the laboratory into a higher orbit where there would be virtually no atmospheric friction. NASA had no intention of losing its very expensive and most sophisticated piece of hardware.

Scientists attribute the demise of Skylab to "unexpected solar activity" in the mid-1970s. A series of powerful solar flares erupted on the Sun which then caused the Earth's atmosphere to swell and Skylab's orbit began to decay much more rapidly.

By 1978 the predicted reentry time was to be late the same year or early in 1979. By 1979 Skylab was only 270 mi above the Earth and all hope had been lost that the first space shuttle could save it. NASA decided to use the onboard computers to change the attitude of the space station so that atmospheric drag would be minimal and so it could stay up longer. It's 87 million mile journey ended in July 1979 as Skylab burned up in a ball of flame and fell in the Australian outback.

It is ridiculous to suppose that America's first space station would have been deliberately put into an unstable orbit. Based on NASA's knowledge of the atmosphere at that time the orbit must have been considered "safe" for its single most important piece of hardware. The rapid decay of the orbit must definitely have been due to unexpected factors. It had been known that its orbit would decay but NASA was certain that Skylab would be up there long enough for it to be saved. Scientists no doubt did sophisticated computations to determine how long Skylab would remain in orbit. So where did they go wrong?

By what mechanism did the Sun assist in the downing of Skylab? Scientists at the time theorized that the atmosphere had swelled significantly because of magnetic activity. What would cause the atmosphere to "swell" by many miles? The connection between the Sun's activity and a considerable rise in the upper atmosphere was totally unexpected–otherwise NASA would

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have done something sooner. Solar flares are common. The link between solar flares and the rising atmosphere seems to have been badly known at the time—or the extent of it seemed unappreciated.

I have also read that the early satellites back in the 1960s suffered quite a bit from atmospheric drag. As mentioned earlier, this is also how they discovered the existence of atmospheric super-rotation because the satellites were subjected to unexpected effects from the atmosphere.

Prior to the ascent of satellites, scientists had used balloons and rockets to explore the upper atmosphere. Surely they would have known the density and height of the atmosphere all the way up into space? Why were they then caught off guard back in the 1960s, and even more dramatically in the 1970s?

It seems to me that perhaps they never expected the Earth's atmosphere to rise and fall. Of course a rising and falling atmosphere is very strange on a solid world. How can the atmosphere suddenly rise? Will an influx of charged particles which heat the upper layers of the atmosphere really be enough to cause this tremendous swelling? In considering the circumstantial connection between solar flares and the magnetic field I have wondered whether a central Sun's activities could result in an outpouring of energy in sympathy with the Sun? Perhaps such outpourings cause a high pressure zone inside the planet which then causes air to pour out of the Polar Holes and for the outer atmosphere to then swell? Perhaps such events also cause the high pressure over Alaska and North America?

CHAOS THEORY

Why is the Earth's weather so unpredictable? Is it because of billions of butterfly effects only? Or is there something more fundamental at fault? The atmosphere can often be amazingly stable, thereby enabling quite accurate predictions to take place. In an article in *Science News*, R. Monastersky wrote:

> At other times the atmosphere remains abnormally stable, providing a chance to predict the weather with remarkable accuracy many days ahead.

Then suddenly, for no apparent reason, things go wrong:

> Earth's atmosphere, the source of all weather, has an inherently chaotic

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> character that can wreak havoc on a forecaster's scorecard. **Sometimes the winds turn so unpredictable that meteorologists can't reliably forecast the weather for two days hence**.[40]

The National Meteorological Center in the USA generally only uses its super-computers to predict the weather for ten days into the future. In 1986 they received a new computer. While it was being phased in, they decided to make use of its slack time to run 30 day predictions. They did this during its first 108 days. They found that:

> **In general**, **the model failed to predict weather changes beyond seven or eight days**. [They have also seen] . . . situations where the model has had substantial skill out to 25 or 30 days. **We've also seen situations where it fails to anticipates a change just three days down the road**.

Why would the same models sometimes be so accurate and then at other times fail so miserably? What could cause such changes? The computer models are the same. The computers are the same. The computers are fed with 10,000 weather measurements each day from the same weather stations. So what has changed? Clearly, the cause lies in the atmosphere itself. But this is nonsensical. Each day the computers are fed with 10,000 current weather measurements. Why should the results on any one day match reality for the next week, while on other occasions the predictions would be totally wrong? Why is the atmosphere sometimes so stable, and then at other times so totally unpredictable?

It seems to me as if these computer models are not behaving the same way that was predicted by the butterfly effect. The butterfly effect is based on the principle that there is a limit to the long term accuracy of one's model. But that limit should remain relatively constant. The extreme variation in the stability of the atmosphere seems to be inconsistent with this.

Scientists have now concluded that their weather models do not produce consistently right or consistently wrong results. Nobody knows why this inconsistency really exists. They have however, developed a method of determining when the atmosphere seems to be unstable. It's called "ensemble forecasting." They run several prediction models and they start each one with very slightly different starting data. They compare the final results. If the

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results from the different models compare well for several days into the future they then conclude that that atmosphere is stable and well-behaved. But, on other occasions they see that this does not happen. They compare models from America, England and Europe to determine the global stability of the atmosphere. Sometimes the models compare well for a week in advance and sometimes not.

"Ensemble forecasting" tells us an important fact. It demonstrates to us that on a global scale the entire atmosphere suddenly behaves in a manner which does not match up with the mathematical calculations of super-computers. But since nothing has essentially changed, we must ask ourselves why this happens. It is nonsensical that highly complex and accurate mathematical calculations can work one day but not the next. This is nonsense. Something must have changed. But what?

The cause must be deeper than merely a butterfly effect. I say that because each day the computers are being fed with new and current data. Let me explain it in another way. If on 1 January, we feed weather data into the system, we can expect to have a relatively accurate prediction for the next few days. By 5 January the predictions will be becoming more inaccurate. By 30 January it will be totally nonsensical. This is what one would expect from Chaos theory and "butterfly effects." But, if we feed the computer new data each day, and we rerun the model each day we should find that its prediction for 5th is now more accurate. And if we do the same on the 3rd we will now know the weather for the 5th with great certainty, and so forth. The butterfly effect is only valid for a certain period into the future. It is not valid for short term weather problems. It seems to me as if these meteorologists have discovered that the entire atmosphere undergoes "global chaos" and the real source of it remains a mystery.

What if these alternating periods of global atmospheric stability and instability were related to air moving into and out of the Earth? This would make much more sense. It would explain why a model works well one day but not the next. Computer models (obviously) are not designed with a Hollow Planet in mind. What if these models are accurate only for the times when there is little or no air movement into and out of the Earth? What if it is on the occasions when air is sucked in or blown out, that the finely balanced weather models are suddenly upset and it becomes impossible to calculate the weather patterns for two or three days hence? This could also be related to the seasons which may cause pressure differences thereby forcing air into or out

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of the Earth.

Let's go back to Goesta Wollin's "impossible" predictions which worked so well. Remember Wollin's two to five day time delay? Note how the magnetic field oscillated but the weather charts and satellite photos at the time showed nothing abnormal! Then, as if by magic, a few days later the air pressure changes and the storm arrives. This remains unexplained. Why should magnetic field changes cause air pressure over Alaska to rise and fall with a five day time delay? It should be obvious that such mysterious changes in air pressure will undoubtedly affect the weather. It will unquestionably affect the accuracy of computer models. Surely this is far more substantive than our theoretical concerns regarding the flapping of butterfly wings?

There can be absolutely no doubt that a large tunnel leading into the Earth would mess up computerised weather models. For suddenly many cubic miles of air might be sucked into the Earth changing atmospheric pressures and wind. Similarly, many cubic miles of air might be forced out of it at other times. The scientists also found that at times their models were incredibly accurate. On occasion they could predict the weather almost for a month in advance. If butterfly wings had the affect attributed to them then this would have been impossible. Perhaps the atmosphere really is far more stable and predictable than scientists have realized. Perhaps, when one knows all the facts, weather prediction can leap forward in many areas?

CONCLUSION

Is the atmosphere really that chaotic? Or is it merely that our models are flawed to begin with? Do many cubic miles of air rush into and out of our planet? Is this what affected satellite orbits? Is this what made Skylab crash? Is this why our computer models break down? Is this the cause of freak storms in North America? Is this why atmospheric pressure over Alaska varies in line with magnetic field changes?

Goesta Wollin was able to predict, with absolute ease, freak and normally unpredictable weather. Might it not be that we are missing a very important piece of the puzzle?

Many scientists have said that the Earth's weather is "manufactured" at the South Pole. Could it be that two Polar Holes in the Earth's crust are the real reasons why our meteorology appears to be "chaotic?"

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Chapter 13: Gigantic Polar Holes?

HALLEY'S GIGANTIC POLAR HOLE

Over the centuries a number of writers have tried to prove the existence of vast Polar Holes along the lines suggested by Halley. Halley's concept called for a huge Polar Hole which would be larger than the Arctic Ocean we now know of. A Polar Hole 2,000 mi across is an impossibility. For such a feature to exist one would have to presume that parts of Greenland, huge sections of Canada and perhaps even the entire northern coastline of Russia would all be lying inside the Earth.

It has been argued that since light is considerably refracted in the cold polar air one would not know that the Earth is curving abnormally. This premise is valid up to a point. Astronomers have long known of the effects of refraction. The Sun and Moon have an angular diameter of half a degree (30'). Refraction is at its greatest when an astronomical object lies on the horizon. The refraction then is 35'. So when the Sun lies exactly on the horizon it is in reality below it. But refraction causes one to still see it for a while. Refraction in the cold polar air is much greater than elsewhere on Earth. LTC Molett, a retired USAF navigator, and polar expert, mentioned that when viewing the Sun through a sextant in the polar regions the general effect is that the Sun is bounding up and down. The effects of refraction are greatest on the lower limb, so the Sun and Moon tend to appear flattened as a result. So yes, it is true that refraction will fool you, but only partially, and even then, it's not truly consistent.

Nevertheless, stalwarts like the Americans, Reed and Gardner, tried to prove a giant Polar Hole existed. The last edition of Gardner's book was published in 1920—several years after Commander Peary had reached the North Pole. Gardner used the writings of Cook, Peary, LT Greely and Nansen to try to convince the Reader that these polar explorers were really entering a gigantic hole which led to the center of the Earth.

With respect to Nansen's historic drifting experiment in the "Fram", he tried to insinuate that Nansen was lost because the curvature of the Earth was different to what we expect. Nansen left the "Fram" and after an abortive attempt on the North Pole, he set off towards Franz Joseph land. Franz Joseph

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land had been mapped by Payer and Weyprect some years before. But they seemed to have made a mess of the mapping and so when Nansen tried to find Franz Joseph land he couldn't.

It is perhaps worth dwelling on some of Gardner's use of Nansen's writings. Some of it is quite amusing in the light of what we know today but it nevertheless reflects the seriousness with which Gardner proposed these ideas. Gardner dwelled on facts which he thought showed that warm air was coming out of a gigantic hole which led into a tropical Inner Earth. Here is a short summary of Gardner's points as they related to Nansen:

1. He cited the occurrence of considerable numbers of mosquitoes which Nansen encountered in Greenland.
2. When Nansen was in Greenland, very probably on the east coast of Greenland he spoke to the Eskimos. Nansen learned from the accounts of other explorers and also from the Eskimos that there were constant legends and rumors ". . . of a fertile land to the north beyond the ice barrier."
3. Nansen saw dust on the Greenland ice cap. Nordenskiold thought this came from another planet (i.e. meteoric dust). Nansen thought that this dust instead came from mountains which were not covered with snow. Gardner hinted that the quantities of dust were too great to account for by Nansen's assumption alone. One of the cornerstones of Gardner's thinking was that colored snow was caused by massive amounts of pollen which originated from lush plant and flower growth. He assumed that dust and pollen blew out from inside the Earth. Hence the suspected presence of large numbers of mountains which were not covered in snow suggested to Gardner that these explorers could not be much further from a warmer clime. [Incidentally, Reed also thought that the dust originated from inside the Earth. But Reed's thinking was different. His Hollow Earth did not have an Inner Sun. So he accounted for the dust as being from volcanoes inside the Earth. Reed imagined huge active volcanoes were spewing forth lava and providing a dim red light for the interior of the Earth. So Reed suggested that all this dust in the Arctic regions emanated from these volcanoes.]
4. Nansen complained of the heat in Greenland and that he was unable to sleep. Gardner took this to show that warm air was blowing from the

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Earth’s interior and that it was warming up the Arctic abnormally.

5. Nansen also mentioned that Nordenskiold had seen two ravens flying from the north. Gardner interpreted this as “. . . pretty good evidence that there was land there that was not covered with ice.” One point I would like to mention about Gardner’s thinking is that this might give us some insight into why so many polar explorers began to believe that a warm continent existed at the North Pole. A great deal of Gardner’s logic rests on the movement of birds, polar bears and foxes. Gardner cited incidents of animals moving northwards for winter as being an indication that the animals were surely travelling to a warmer clime instead of going south as most other animals do. When birds flew from various directions it was assumed that they had come from dry land.
6. In 1894, when Nansen was at a latitude of 79–80° he noticed a warm wind blowing from the north. Nansen wondered why the thermometer rose whenever strong winds blew. Gardner used this to suggest that the air was originating from inside the Earth.
7. At a latitude of 80°, Nansen sees a mirage of the Sun. It is very flattened. Gardner then wondered if this strange mirage could be of a Sun inside the Earth. Of course, if he had specified in which direction Nansen had been looking it would have helped! I’m sure Nansen would have told us if he saw the Sun lying to the north! Since he doesn’t, I think it’s fair to assume that the Sun lay in the east or west or south — which would be a reasonable place to expect to see the Sun. As can be seen, Gardner sometimes took some chances without digging deeper into the data.
8. On 3 Aug 1894 Nansen shot a Ross gull. He commented that this bird was very rare and that nobody knew where they lived. Gardner jumps at this suggesting that Ross gulls come from inside the Earth.
9. The one really interesting criticism of Nansen however was the incident during which Nansen got lost. Nansen had left the “Fram” in February 1895. He tried to reach the North Pole but later turned back. Now he was going to head southwards to land. Gardner tried to show that arctic navigation was filled with unknowns and that explorers were really only guessing where they were going. For example, on 29 Mar 1895, Nansen took an observation which showed them to be at a latitude of 85° 30’. Nansen is quoted as writing: “I could not understand this; thought that we must be in latitude 86°. . .”

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In the following days Nansen mulls over various navigation errors. But then Nansen struggles to find Franz Joseph land. Day after day he heads towards the islands which were mapped by Weyprect and Payer, but he cannot find them. By 31 May he writes “It is impossible we can have far to go now. . . still no glimpse of land; this is becoming more and more of an enigma.”

By 11 June Nansen comments: “We do not know where we are, and we do not know when this will end.” Nansen only sights land on 24 July but still has no idea where he is. He wrote “This land grows more of a problem, and I am more than ever at a loss to know where we are.” As the months go by, Nansen finds more land but still has no idea where he was. By February 1896 he still does not know where he is. Nansen goes over his calculations again and again and can find no error. He ponders the compass variations and the sightings of birds to the north.

Nansen is puzzled by all of this. He notes that Payer is an experienced topographer and that he has a high respect for him. Why then couldn’t he find the various islands and lands which he had mapped as being a part of Franz Joseph Land? Nansen wrote:

> The whole thing was, and remained, an insoluble riddle. . . But the enigma over which we had pondered the whole winter still remained unsolved.[1]

Gardner used this example to show that arctic navigation was largely guesswork and that Nansen was really lost because the curvature of the Earth was different to what he expected.

However, in looking at the maps which Weyprect and Payer had produced, it seems to me that perhaps they had merely made mistakes and had mapped “land” which really did not exist. They mapped Franz Joseph Land as being a large archipelago, and as part of a larger continent. Hence when Nansen came down from the north he expected to find land which in reality was not there. Nansen became very confused. It seems quite clear that Nansen knew what he was doing and where he was going. The error seems to lie with the maps produced by Payer.

Gardner’s reasoning is interesting but we now have answers to many of the things he considered to be riddles. Of all the points he made, perhaps the only one of interest to us is Nansen’s encounter with the legends of the fertile

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land which lay north. Here, from the Arctic Eskimo we find talk of something similar to the Hyperborea of Greek and Roman times.

PEARY'S SLEDGING SPEEDS

Gardner tried to use the writings of the American, LT Greely (later to become a General), to show that the horizon was becoming ever shorter. This, Gardner argued, showed that Greely was on the rim of a gigantic hole and that he seemed to progress ever faster because the length of a degree was now much shorter.

Peary's sledging speeds have been the subject of debate this entire century. The argument is that Peary travelled far faster than can be reasonably expected in the Arctic. Therefore, the argument goes, he could never had reached the North Pole in the time that he did. When Peary reached the North Pole he had some Eskimos with him and Mathew Henson, a black man. Many people have tried to use Mathew Henson's vague statements to discredit Peary. Earlier this century Peary's detractors made much of the fact that no "white man" was there to witness Peary's attainment of the pole. Thus, they argued, we only have his "unsupported word."

As will be seen, many were quite happy to use Eskimo testimony to discredit Cook. So if Eskimo testimony was good enough to discredit Cook then why wasn't it good enough in support of Peary? Of course the other part of the argument is that the Eskimo's knew nothing about maps and distances. But here again we have Henson who was Peary's companion for many years. Gardner quotes Henson's words from the *New York World*, 3 Oct 1910. In this interview Henson stated that they travelled 20–40 mi a day. By playing around with the numbers which Henson gave, Gardner tried to show that there was a discrepancy between Henson's words and those of Peary.

I was surprised that Gardner did not use Peary's sledging speeds as possible proof that Peary was going over the rim of a hole and into the Earth. Instead, Gardner tried to use the sledging speeds to show Peary to be a liar. It is almost ironic that later this century, Wally Herbert, the famed British polar traveler would attempt exactly the same thing. In the 1960s he led the British Trans-Arctic expedition which journeyed across the polar regions from Point Barrow in Alaska to the island of Spitzbergen. It was a journey which lasted from February 1968 to April 1969. Herbert used detailed arguments similar to those of Gardner and succeeded in convincing the National Geographic

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Association that Peary was a fraud. They had sponsored Peary, and it must have been a big disappointment to them to have to admit that Peary was a fraud.

Many ideas went through my head as regards this whole Hollow Earth business. The “mini-hole” idea took quite a hold of me early on. It was a large part of the impetus which caused me to reevaluate all these old ideas. Large holes were impractical but I think we still do not have enough knowledge to totally exclude the idea of “mini-holes.” I spent years considering various locations for miniature holes in the Earth’s crust which might have remained undetected or hidden. One of the locations I considered, as a result of the Peary controversy was a mini-hole exactly at the geographical North Pole itself.

As will be seen later, I have many reasons for contradicting this very idea. Later the Reader will be faced with the many arguments which suggest the Earth has tilted several times during its existence. Hence I think it very unlikely that a Polar Hole could have remained exactly at the North Pole for billions of years. And even if the Earth did not change its tilt, what’s the chance of a mini-Polar Hole lying exactly at the North Pole? When all factors are considered, this idea has many problems. Nevertheless, I was still curious about Peary’s sledging speeds just in case it could shed some light on the Earth’s curvature. It was also important in helping to establish Peary’s general credibility and reliability as a polar explorer. I say this because we will investigate another Peary mystery, Crocker Land.

I wondered if Peary’s anomalous sledging speeds could be explained in terms of Earth curvature gone wrong. The idea of a mini-hole at the North Pole itself has a number of attractive possibilities. Let us examine the navigation problems associated with possible holes in the Earth’s crust which could deform its curvature. How would this affect navigation?

Navigation is based on a system of coordinates. Lines of longitude lie directly in a north-south line, from the geographical North Pole to the geographical South Pole. These lines converge on these points. Lines of latitude lie in a west-east direction and lie parallel to one another. One can locate any spot on the face of the Earth by giving its longitude and latitude.

In early times it was easier to determine latitude than longitude. In the times of Columbus and earlier, sailors used to sail their ships to the latitude of the destination and then set out westwards or eastwards from there. They did this so that they could “run into” their target destination. They had no way of

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knowing how far they had sailed east or westwards. One can see this technique used by Columbus when he set out to find the “New World.” On Peary’s final assault on the North Pole he was not too concerned with longitude. He mainly took readings to determine his latitude.

Longitude is determined by having an accurate chronometer. When determining latitude and longitude one “shoots” the Sun or some star with a sextant. One then consults various tables and from this one can determine one’s longitude and latitude. That is a very simplified explanation of navigation. A sextant is extremely accurate and one can determine angles to within small parts of a degree. LTC Molett told me that in practical terms one can navigate with an accuracy of about 2 nmi. A complication in the polar regions is the refraction of light. The Sun, which is the object most commonly used for reference purposes, tends to lie low on the horizon and to bounce wildly up and down due to refraction in the cold polar air. Even so, navigation is quite accurate. It becomes slightly more inaccurate as one approaches the North Pole itself. Molett told me that if one uses an arctic grid system then navigation at the pole is as accurate as anywhere else. Since he taught arctic navigation in the USAF and flew 91 times to the North Pole, he should know what he’s talking about.

Latitude is the more important of the two components in considering the problems of going over the rim of a hole, so let us concentrate for the time being in the issues of determining one’s latitude. In Figure 13.1 we see a diagram of the Earth. We assume that this is midday on a day when the Sun lies directly above the equator. The Sun moves north and south of the equator and this complicates navigation considerably. The various tables take this into account. But for the purposes of explanation let us consider the simplest situation. If one is at the equator at midday on this particular day, then the Sun will be at the zenith, directly above you. Someone standing at the North Pole (latitude 90°) should see (excluding refraction of the air), the Sun lying directly on the horizon at the same time. Thus the Sun will be at an angle of 90° above the horizon for someone at the equator, while lying at an angle of 0° above the horizon for someone at the North (or South) Pole.

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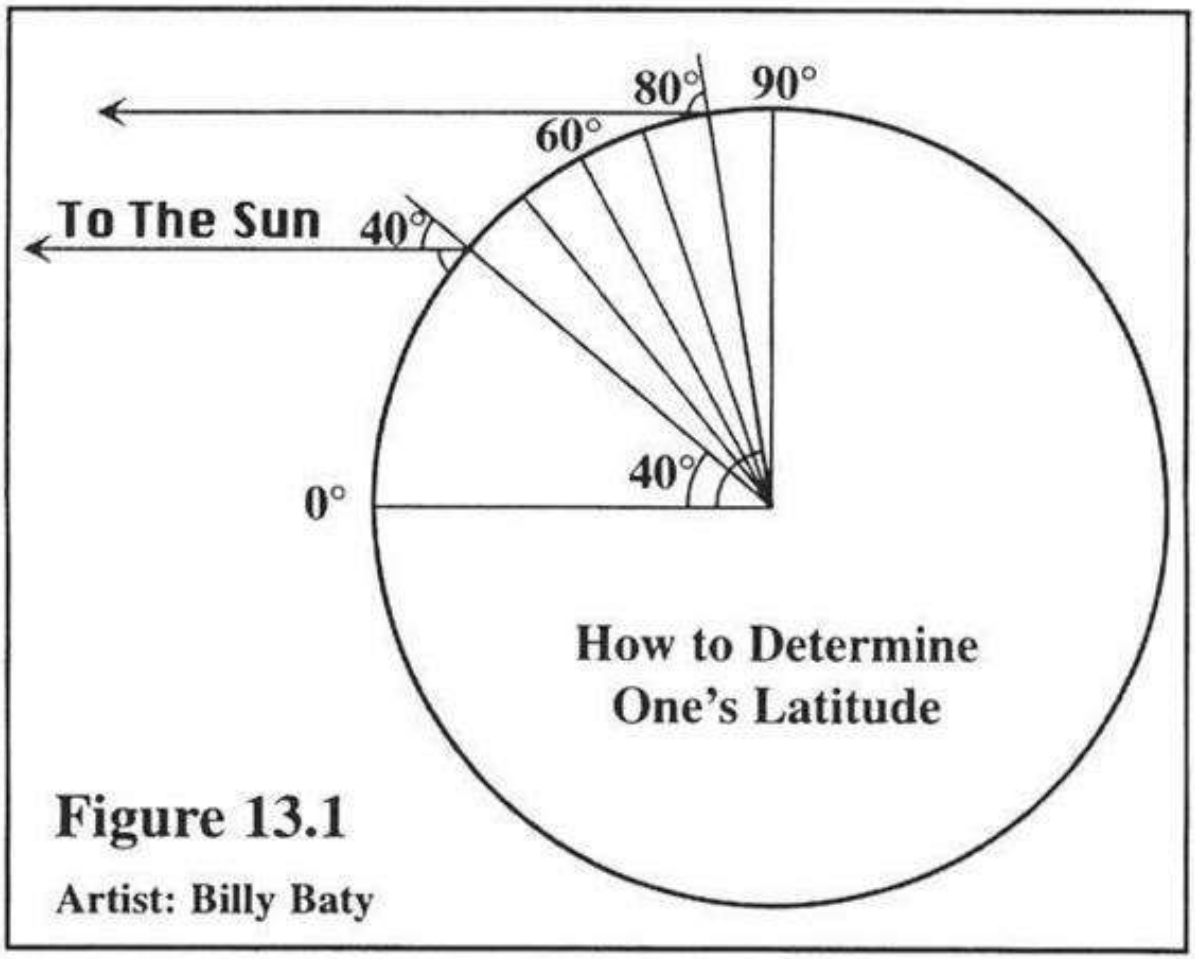

Figure 13.1

Artist: Billy Baty

Latitude is a measure of an angle from the center of the Earth. As can be seen in Figure 13.1 by the principles of geometry, the angle between the Sun and the zenith directly above you is exactly equal to your latitude. So for someone at a latitude of 40° north, the Sun will be 50° (90° - 40°) above the horizon at the same time.

Latitude is based on the concept that the Earth is a sphere. Hence a degree of latitude should theoretically be the same length everywhere across the surface of the Earth. The lines of latitude are equally spaced. Strictly speaking, because of the slight flattening of the Earth in the polar regions this is not true. But the flattening is minor and LTC Molett told me that for all practical purposes it makes no difference to arctic navigation. But what if the Earth was of an irregular shape? Imagine a large asteroid as depicted in Figure 13.2. If one were to apply the same principles to it as to the Earth, then from a navigation point of view this asteroid would have three places on its surface where the angle to the Sun would give the same reading. This

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asteroid, being of an irregular shape would have three “North Poles” (N1, N2, and N3) and one South Pole. This irregular shape would lay waste to the neat principles of navigation which work so well on a sphere. And if you were walking on the surface of this world how would you know which “North Pole” you had reached? By latitude alone you would not know. Unless you used some other principle you would have no idea.

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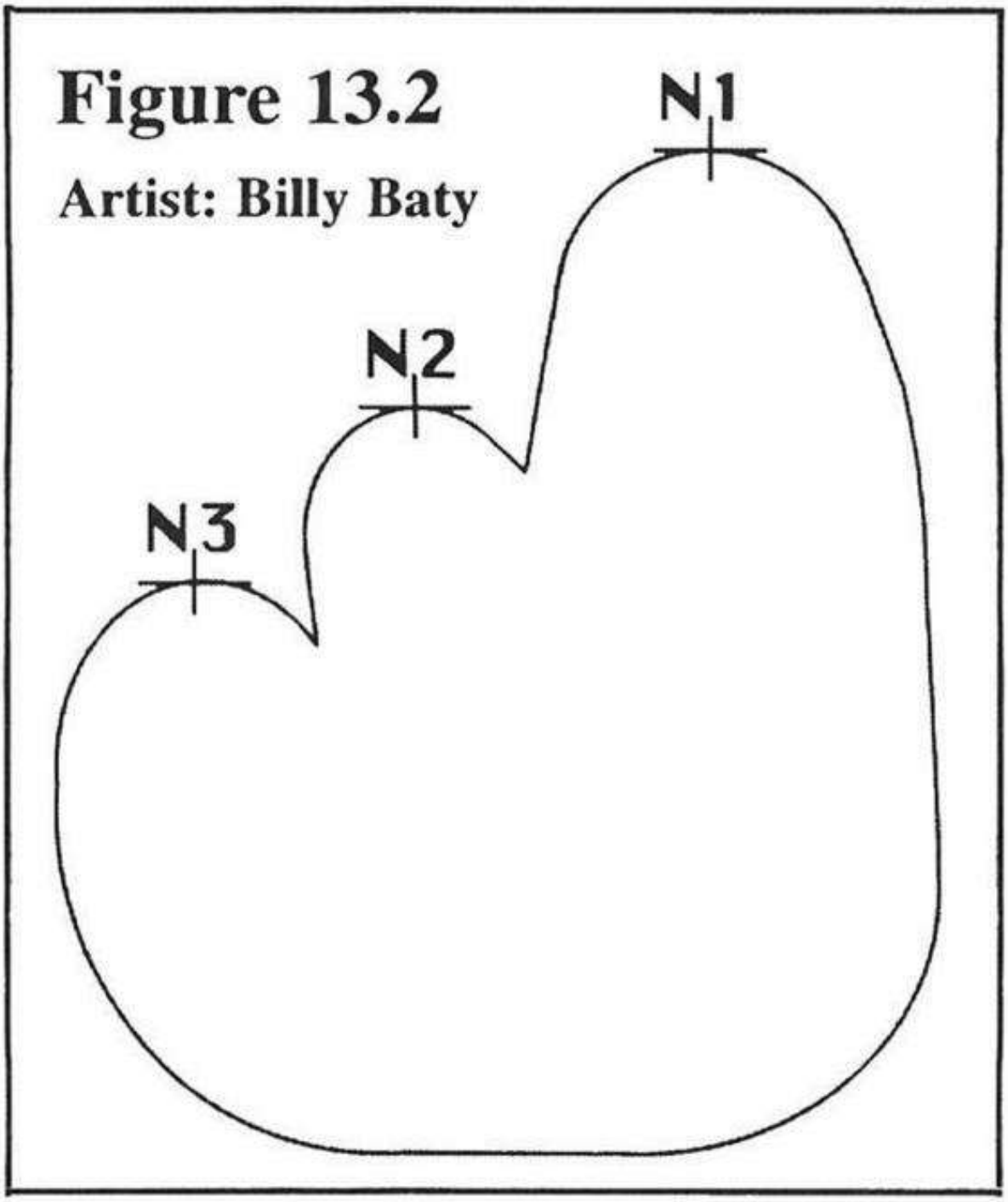

So what would happen on a Hollow Earth as proposed by Halley and Gardner? In such a case the entire rim of the gigantic Polar Hole would become the “North Pole.” In Figure 13.3 I have marked N1 and N2 as the North Poles depending on where you came from. But in reality the North Pole would be a line all around the rim of this gigantic hole.

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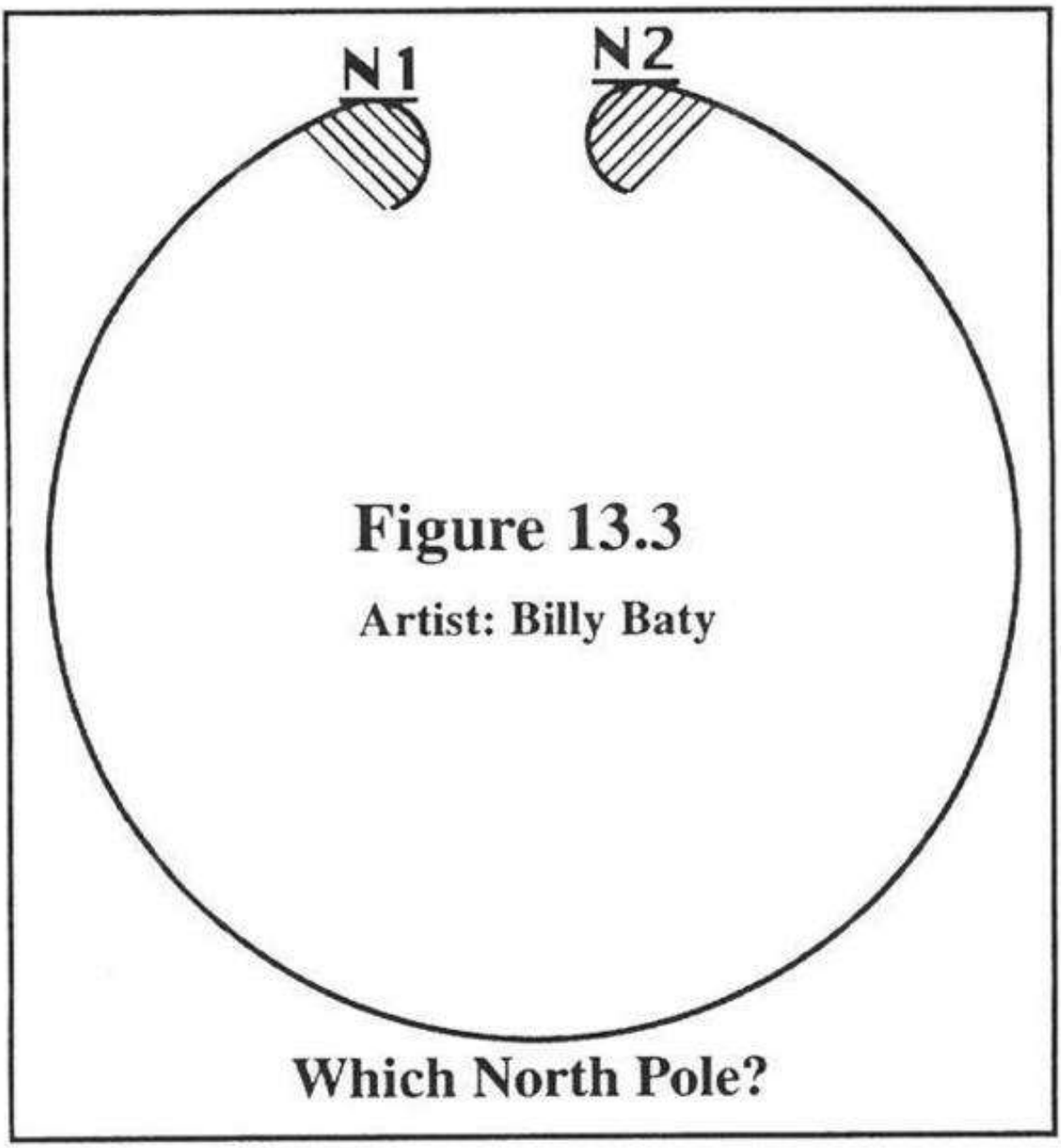

So how would the arctic explorers of yesteryear such as Peary, have realized such a situation? Since they would not have maps or satellites to use how would they then deduce that they are on the rim of a hole?

Two things would happen. Firstly they would know the length of a degree of latitude. As they moved over the rim the curvature of the Earth would increase and a degree of latitude would become ever shorter—very noticeably so. They would suddenly find themselves moving through large distances in terms of degrees while actually not travelling far on the ground.

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There can be no question that they would notice this within a day or two at the most.

The next thing is that they would reach the North Pole far sooner than they expected. By knowing the length of a degree they would have planned their journey beforehand and known the exact distance they need to travel. By arriving there sooner they would know something is wrong. It would not take people long to figure out what had happened. Based on their records scientists would easily determine the width of any Polar Hole.

A third complication would be that two parties approaching the same pole, but from opposite directions, would not arrive at the same spot. The one group would end up, as in Figure 13.3 at N1 while the other would end up at N2.

Here on Earth a number of expeditions have crossed directly across the North and South Poles, or have approached from different sides and met at the requisite pole. These expeditions have therefore adequately tested and disproven, by their actions, the possibility that a hole could exist at either the North or South geographic poles. The problem is actually slightly more complex than this however since the Earth is inclined at 23° 30’ to the Sun. But there is a situation which is much more complex and difficult to deal with. That is the idea of the “mini” offset, Polar Hole. Such a feature would be a navigational nightmare. And we will return to it later.

Let us return then to the problem of Peary’s sledging speeds. What is the solution to the problem? Was Peary a liar? Was he on the rim of a hole without knowing it or what? According to Gardner, many arctic experts challenged Cook’s statement that he travelled 15 mi a day. But, asks Gardner, what of Peary’s speeds which are supposed to be more than double that of Cook? Surely then Peary is also a liar? On many days, Peary travelled 28 mi per day, and on one day he even managed 40 mi. Wally Herbert, himself a Polar traveller, levelled the same charges against Peary but with much more evidence.

Gardner quoted an instance where Peary had been asked by a journalist in Labrador about arctic travel. Peary had likened it to pushing an ox-drawn plough which could strike a pressure ridge at any moment and throw you off your feet. Peary described it as a slow and difficult process. Gardner then asks how Peary could possibly have managed to travel at speeds which at times were faster than a pedestrian walking.

Herbert adds 25% to the distances which Peary said he travelled.

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Herbert does this because during his 1960s British Trans-Arctic expedition he estimated that he had to make so many detours that it added 25% to the distance he had to travel. The ice and snow in the Arctic Ocean is not flat and smooth like an ice-rink. The ocean currents cause the ice to be crushed together creating moving pressure ridges can be very high and extremely difficult to cross using a heavily laden sledge.

Both Peary and Herbert's statements are therefore understandable. Peary did not keep an exact hour by hour log of his travels. He tended to note how long it took him to complete a particular leg of his journey. So his exact movements hour by hour are open to question.

The main question regarding Peary is not his speed up northwards to the pole but his speed back from the pole. One would, off-hand, have expected him to take the same length of time to cover the same distance. It is therefore highly suspicious that he covered the distance back at almost twice his original speed. One would also have expected his men and dogs to be more tired on the return journey so how could they have moved even faster? This discrepancy has been pounced upon by many to denounce Peary.

Gardner states that it took Peary two days to cover 133 nmi on his way back from the pole. He then says that this translates into 153 statute miles travelled in two days—or 76.5 mi per day. How, asked Gardner, can Peary have travelled 76.5 mi per day when going through the snow at the same rate as an ox-drawn plough? The insinuation is that Peary "cooked the books!"[2]

Herbert, many decades later plays the same game. Back in the 1960', after his British Trans-Arctic expedition, Herbert had already begun expressing his view that Peary's journey was improbable. He referred to Peary travelling 800 "unwitnessed" miles from his last camp at latitude 87° 47' to the pole and then back to Cape Colombia. Herbert, being kind, only added 10% to this distance (for detours), and stated that Peary must have averaged 34 mi per day, and on four days Peary must surely have attained speeds of at least 46 mi per day. This, Herbert insinuates, is impossible.[3]

LTC Molett wrote a very interesting article for the *Journal of the Institute of Navigation* in 1992 wherein he defended Peary. Molett examined Herbert's analysis of Peary's sledging speeds. Peary's fastest speeds were on his return journey from the pole. This was the same leg which Gardner had referred to. It covered a distance of 130 nmi. Peary travelled this distance northward in five marches of 26 nmi each. On his way back he did it in three marches of 43.5 nmi each.

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Both Herbert and Molett examined Will Steger's 1986 expedition. Steger, using six men had retraced Peary's route to the pole. He did it just like Peary did, without any resupply or navigational assistance. Steger believed that his expedition had adequately answered the problems raised by Peary's detractors. Steger noted that many believed it was not possible to travel 30–50 mi per day in the Arctic.

Steger started his journey with sledges which weighed nearly three times that of Peary's sledges. Steger was sure that his dogs were therefore more worn out than Peary's dogs. But, as Steger wrote: "Yet the average for our last five marches. . . was virtually the same as what he [Peary] had clocked on his final dash." Herbert then proceeds to split hairs by saying that Steger's times amount to 21.7 nmi per day. Molett then asks whether there really is much difference between Stegers 21.7 nmi and Peary's 26 nmi?

Herbert then compared Steger's northward march with that of Peary. He deduced that Steger's speed was 18.13 nmi versus Peary's 30.95 nmi. Molett questions his procedure because he allowed Steger a travel time of seven days, two of which Steger was not travelling north. But Peary's speed was calculated over four days, when he too rested for two days. So, asks Molett, shouldn't Peary's speed have been calculated by dividing by six instead of four?

At another point, Molett chides Herbert by saying: "If one is going to use fractions of days to determine a day's march, one should consider that Steger made 32 nmi in half a day, which is a rate of 64 nmi per day."[4] So how can one account for Peary's sledging speeds?

As Steger and Molett point out, the pressure ridges which cause so many problems and detours at the lower latitudes disappear from latitude 87° north onwards. In these last 3° to the North Pole the ice conditions improve considerably and travelling is much easier. The real bone of contention is the 130 nmi to the pole and back. Here we have the fact that the ice conditions are very favorable, as attested to by all polar travellers. Of course Herbert should know all this since he has been there.

Steger firmly believed that his expedition had proven that Peary's travel times were not farfetched at all. The mere fact that Steger could travel 32 nmi in half a day is itself an eye-opener. Such a speed is higher than any ever attained by Peary in any of his marches.

Other factors played a role. Peary had parties which turned back at given points and which prepared the way southwards. Hence on his journey back

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from the pole he was covering a prepared path. The experiences of all polar explorers was that one's speed tended to double on the return journey because the lead dogs could already follow the prepared path. In spite of the men and dogs being tired, there was also the issue of sledge weight. On the way back the sledges were virtually empty.

Cagni had used techniques similar to Peary a century ago. He had noted that in going northwards they had to beat the dogs every step of the way. But on the way back the dogs seemed to instinctively know that they were going back and the dogs were very energetic. It was the only time that the men could allow themselves the luxury of mounting the sledges instead of running. The dogs raced along for four and a half hours with only two stops to catch their breath. Cagni thus found himself taking two days to travel back along a path which originally took four days to cover going northwards.

Other factors played a role. The temperatures were such that the friction on Peary's sledges were reduced. Peary lost his sounding equipment which had weighed at least 100 lb. Peary also discarded excess clothing at the North Pole which they did not need any more. This clothing was quite heavy. Remember that on the way northwards Peary's sledges had been carrying provisions much of which had now been eaten. The sledges were getting lighter by the day. The dogs each ate 1 lb of food per day and the men 2 lb per day. The 40 dogs and 6 men thus consumed 52 lb of rations per day plus an additional 80 lb when the dogs had double rations. Molett points out that Peary's sledges carried 500 lb each on their way up to the pole. On leaving the pole they were weighing less than 400 lb each and were getting lighter by the day. On their way back there were igloos ready for them too. A final unexpected boon was a gale force wind which was blowing from behind.

When all is said and done, and one considers Cagni's experiences, and Cagni was inexperienced compared to Peary, then Peary's achievements are understandable. Steger had travelled the same route as Peary, but with sledges loaded to three times the weight of Peary's. Yet Steger had achieved travel times very close to that of Peary.

Herbert's own travel methods are interesting. In his British Trans-Arctic expedition he had 100 dogs and sixty sledges. His dogs could only pull ten sledges on each journey. He therefore had to keep going back and forth with the dogs to pull the next set of sledges. The total weight of his sledges was a staggering 72,000 lb —i.e. 1,200 lb per sledge. Herbert's speeds also picked up as he used up the supplies and there was less and less to carry. Initially his

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speeds were very low.

Steger's sledges, carrying three times the weight of Peary's would have weighed in at 1,500 lb each. Peary's sledges only carried 500 lb or less. Peary started out with 24 men, 19 sledges and 133 dogs. Compare that with Herbert's 60 sledges and only 100 dogs to pull them. Peary's parties turned back one after the other according to a strict regimen which he had devised. Those who turned back then prepared the path homewards for his final team. Peary's military style of doing things was extremely efficient. The pole-ward dash was planned to be very fast. He only had 40 dogs and 6 men for the pole-ward dash. And even here, he had deliberately kept the freshest dogs for this final dash.

When all the factors are considered in a reasonable manner then perhaps Peary is after all the real hero. It goes to show that at the turn of this century, Peary (another of our "unreasonable men!") had indeed accomplished something truly great with the primitive equipment of his time. His achievement was so great that decades later men would ponder just how the heck he had managed to do it all. He had been absolutely fanatical in his desire to reach the North Pole. When he was a young man he had once written to his mother stating that the fame of Columbus would only be matched by the first man to stand at the North Pole.

At school Peary had been a straight A student. He won a commission as a civil engineer in the US Navy. He was the second in command in surveying the proposed Nicaraguan route for a canal between the Atlantic and Pacific oceans.

Peary's military background served him well. He was to use it in his arctic explorations. His techniques were very advanced. He believed in living off the land. He hunted for food, thereby reducing the need to carry large amounts of provisions which needlessly bogged one down. He out-did the Eskimos at their own methods. Peary's military style resulted in him making use of entire Eskimo villages to help him in his tasks. He made considerable use of Eskimos and their dogs. Admiral MacMillan, one of Peary's close companions, and a great admirer of Peary was to remark that Peary was an absolute expert at using dogs. Dog handling was a difficult task and required considerable practice and expertise. Peary was the highest practitioner of this art.

His precise military style planning and assault on the North Pole certainly makes Peary, in my humble opinion, a true hero and a credit to his

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nation. No polar explorer of his time travelled as much as Peary did.

Peary's sledging speeds are no proof whatsoever of any kind of curvature problem in the Arctic. And it seems to me that there is more than adequate reason and explanation for it. In the end I find myself siding with Peary and his supporters. It is my opinion that those who tried to slate Peary were merely nit-picking and they don't really have a case. It is sad however that the National Geographic Society ended up denouncing him. Nevertheless LTC Molett continues his determined attempts to clear Peary's name via the Institute of Navigation in the USA.

SPACE PHOTOGRAPHS

Let's ease off on all the science and heavy stuff for a moment. For a change of pace let's take a look at some photographs. Perhaps you will smile or even laugh at my attempts at finding NASA photographs of holes leading into the Earth.

Only I would be foolish enough to admit that I actually looked for space photographs of holes leading into the Earth. I have no problem admitting my ignorance. Rather than keeping one's mouth shut, and pretending to know everything it is much better to instead admit one's ignorance, humble oneself and ask questions. By admitting one's ignorance one only suffers from humility for a short moment. Once one knows the answer then the ignorance about that matter disappears forever doesn't it? So ignorance, in my opinion, is only a temporary state of affairs easily overcome by asking questions. One of my heroes, Napoleon, Emperor of France, was excessively curious about all manner of facts. Curiosity, as far as I know has never been a sin—except in military circles. It is in fact, one of the cornerstones of science.

I was very curious about those satellite photographs which supposedly showed a hole in the Earth. So I, and a number of other folks set off on a search for every possible photograph which might show something anomalous. Not only am I open-minded, but you can throw in a good dose of gullibility too. So I spent a lot of time exploring this idea of a gigantic Polar Hole—in spite of the many difficulties which one would have in explaining why such a thing had not yet been discovered. My procedure is to bring in all data, no matter how bad it is, and to only exclude it when I have a sound reason to. That way I explore all the possibilities fully.

I was pleasantly surprised at how many folks participated and helped.

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We were afflicted with something of a collective madness—and it was fun. We stumbled upon a surprising number of really fascinating photographs. I also hounded some of the NASA people at Johnson and Goddard Space Flight Centers. Some were extremely helpful, especially Mike Gentry. So let's go through the photos and take a look at them —some of them are spectacular and beautiful.

The photograph I had seen in a public library turned out to be from the ESSA 7 satellite in the 1960s. Take a look at Plate 6 . When Hollow Earthers in the 1960s first presented this satellite photo as evidence they stated that the Earth's Polar Holes were covered by fog and mist. These ideas were borrowed directly from Marshall Gardner and others earlier this century. They believed that the hot air from the tropical Inner Earth caused a constant fog in the polar regions and that this obscured a huge polar entrance. They argued that one could not see this Polar Hole most of the time because of the fog which covered the polar regions and which was impossible to tell from the clouds and snow in the region.

This photo, so they said, represented one of those exceptional days when the fog cleared and, for a short time, one could look into the vast chasm leading into the Earth. The black region is where the Earth curves inwards and the Sun cannot shine into it. Pretty neat eh? Well, I was a kid then and when I saw that photo I thought "Cool, the Earth has a gigantic hole in it." The fog explanation worked for me and I never forgot that photograph.

NASA's explanation for this photograph is that it is a montage of photographs taken over a period of time. So who's right?

The real key to this photograph lies in recognizing that there is no night side in this photograph. Here one is looking down on the Earth from the North Pole and the equator lies on the outer edges of the photograph. The Earth is inclined to its orbit by 23.5° and so the Arctic regions can have 24 hrs of sunlight in mid-summer. I don't know when this "photo" was taken so one could perhaps have argued that it was taken in mid-summer. But, the Earth is only tilted by 23.5°, and so 24 hrs of sunlight can only exist within the Arctic circle. In this photo we can see the sunlit regions stretching down to the equator. This is clearly an impossibility. The only valid explanation therefore is NASA's.

But where does the dark hole in the middle come from? This montage must surely then have been produced, not in the northern summer, but in the northern winter when part of the Arctic circle lies in darkness for 24 hrs. So

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as the NASA satellite orbited the Earth and the montage was put together there was a certain region surrounding the North Pole which lay in total darkness for 24 hrs and it ended up looking for all the world like a “hole.” According to NASA this photograph was taken on 23 Nov 1968, during the northern winter.

Also, if there really is an Inner Sun inside the Earth then surely it should have been visible in a photograph of such a very large hole? It depends on whether it moves around or not. It is a reasonable expectation to have seen such a thing on this photograph especially since the satellite’s perspective is centered directly on this huge hole.

A final point is that one could probably estimate the time of year when this montage was put together. One could do it by estimating the width of the “hole” in terms of degrees and then comparing it with the Sun’s motion. And what’s the bet that the resultant time of year will match the date when NASA says this montage was produced?

Other early satellite photographs suggested the existence of a glowing circular hole—light shining out of the Hollow Earth? An example of this type of photograph can be seen in Plate 4. Here you see the Earth from somewhere above the Arctic. The day side can be clearly seen, as can the night side. Look at that enormous glowing circle. That would have done old Halley proud. In fact, this is probably what Halley had discovered. This is the auroral oval which we examined earlier. In Plate 5 you can see the auroral oval overlaid with a map of the world. In this case, if it were a real hole then Russia would lie on the rim of the hole, and all of Greenland would be swallowed up inside of it, and parts of Canada would also lie inside. Of course this oval moves considerably. Nevertheless, it can be seen that this is in no way a hole into the Earth.

Take a look at Plate 8. Look at that enormous circular feature north west of America—and you guessed it—it lies in the Arctic. So that’s why they did not find it! It lies on the edge of the polar ice cap!? No, not really. It’s no hole, but it certainly does look good. There’s a certain 3D effect to it as well, with perhaps even a hint of cloud flowing “into” it. For a closer view of it take a look at Plate 7. The NASA captions accompanying these photos state that they were taken on 16 Apr 1972 by Apollo 16. The first photo was taken 1 hour after translunar injection, and the other, further away, was taken half an hour later. This feature is approximately 900 mi in diameter. What is it?

At first I thought it lay in the Beaufort sea, just north of Alaska, and a

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favorite hunting ground of mine for holes into the Earth (because it is close to the north magnetic pole). Since it's seemed to be similar in size to the Beaufort sea this photograph really caught my interest. I asked Dr. Gordeev if he could determine its exact position. For him, being a Professor of Mathematics it was a case of "simple mathematics." He quickly derived an appropriate formula and told me where it was. A factor which causes considerable confusion in looking at satellite photographs is the foreshortening which occurs when an object lies near the limb. This can make estimates, and even mathematical calculations very error prone. Nevertheless, Dr. Gordeev estimated that his calculations were accurate to within 50 mi—which was more than adequate for my purposes.

In this photograph one can see the Gulf of California and the peninsula quite clearly on the western side of the USA. If one draws a line up from it then this line cuts almost through the middle of the "hole." Calculations showed that the northern tip of the "hole" lies in the Kamchatka Peninsula in Russia. A closer look at a map reveals the cause of this feature. The Aleutian islands lie south of Kamchatka and the Bering strait. This feature lies south of Kamchatka and Alaska. It seems as if its northern border is a mountain range in Russia and its southern border is in the region of the Aleutian islands. There is computer software which one can use to draw a map of the Earth from any angle and altitude. Using such software, and I produced Plate 9. Here you can see, how, from California, one could determine the location of this feature in the Bering sea. I have marked, very roughly, the position of this feature.

A retired NASA employee, who does presentations of space photographs for a living, told me that there is a low-level fog which lies in this part of the Bering sea and that's what causes this feature. If one looks closely at a map or globe of the Earth then it becomes apparent that the Aleutian islands, Kamchatka and Alaska form an almost circular feature of enormous proportions. I couldn't help wondering if the Earth was struck by a meteor here in earlier times. Another gent informed me that there are certain circular air currents which form at a latitude of 60° and this is one of those features. And guess what? The center of the "hole" lies at exactly 60° north! This feature might be a part of the meteorological phenomenon known as the Aleutian Low.

The "rim" of the feature had held my interest for a long time, it is very pronounced, especially on the photos taken from further away. There is a

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good Apollo 13 photograph of it and it looks very impressive. Plate 10 shows another Apollo 13 photograph but this time there's no "rim." But here we still see the circular air currents lying in exactly the same position.

Finding the answer may not have been as exciting as finding a hole into the Earth. But it nevertheless leaves one with a sense of excitement at some of the more interesting aspects of science. When you have holes on the brain you tend to see them everywhere! Lots of people forwarded all manner of satellite photos to me. Most of them were easily discounted. And how irritating it was that they occurred at all manner of latitudes and positions, from Antarctica right up to the North Pole. They mostly turned out to be storms and various temporary circular air currents.

Take a look at Plate 11. This was taken by Apollo 10 at a distance of 36,000 mi. Once again one can see a different form of atmospheric activity occurring in the Bering sea, which we saw in the Apollo 16 and 13 photographs. This time I fancied it looked like a "hole" covered in cloud with some streams of cloud "pouring over the edge!" Note that clear circular shape.

Note again how a line directly from the Gulf of California would almost cut through it. But this time also look to the right of it. There is an open patch of ocean with a much smaller, brighter, circular cloud feature in it. This seems to me to be lying in the Beaufort sea exactly where I had been looking for some kind of hole. That small circular feature is easily missed. However, a quick measurement of the photo and a rough calculation, based on the polar diameter of the Earth (7,900 mi), shows that tiny feature to be a staggering 400 mi in diameter! The Beaufort sea also has circular currents and this seems to be a similar effect in that region. Note that this feature was not present in the other Apollo 16 and 13 photographs of this region. This is also a weather phenomenon.

The Eighth Earl of Clancarty wrote a number of books under the pseudonym: Brinsley Le Poer Trench. One of them was *The Secret of the Ages* (1974). In it he presented a number of black and white satellite photographs which show a "hole" at the top of the Earth. One is the ESSA 7 photograph which we've seen.

Then there was an ESSA 3 photograph of the North and South Poles. The "northern hole" being visible, while the "southern hole" was "covered in cloud." The ESSA 3 photographs suffer from the same problem as ESSA 7. One can see that the equator is visible in all directions. This indicates that this

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is a montage. Furthermore, the fact that the “northern hole” is visible while the southern one is not, is an indication that this photograph was taken during the southern summer. And guess what? The NASA captions state that these photographs were taken on the 6 Jan 1967—northern winter and southern summer. There is therefore no mystery in these photographs what-so-ever.

Brinsley Le Poer Trench presented two photographs, similar to the one seen in Plate 12. His caption read “This photograph was taken with the ATS-III satellite camera from a height of 23,000 mi. Note what looks like a ‘Moon crater’ at the top of the picture. This could be the lip of the hole from another angle.”

The ATS III satellite produced a whole stream of “Hollow Earth” photographs. ATS III was actually a test satellite intended for scientists only. A number of its photos were distributed, and some reached the public. The vast majority however did not. For a long time I delved into the mysteries of the ATS III satellite and was absolutely determined to discover if these photographs were for real. What makes the ATS III images so interesting is the apparent 3D effect—one is looking from the side and there is a definite hint of an inward slope. This feature is roughly 800 mi across.

ATS III was one of a series of “Advanced Technology Satellites” (hence the acronym ATS) controlled from Goddard Space Flight Center. ATS III was the most successful of them. It has been in orbit for approximately 30 years now and it still acts in a communications role. It only produced photographs for approximately the first decade of its existence. Most of its photographs were black and white like the ones Brinsley Le Poer Trench used. But some were color like the one in Plate 12.

ATS III is a geostationary satellite. This means it orbits at roughly 22,000 mi out in space and is positioned almost exactly on the equator. It’s orbital speed at this distance matches the rotation of the Earth. Hence it appears to remain in the same spot with respect to the surface of the Earth. ATS III was stationed directly above Brazil.

As can been seen, the polar region is covered with clouds and it’s virtually impossible to determine where the “hole” is. Again, I turned to Dr. Gordeev for some answers. He told me that he saw this photo in a book wherein it referred to this as an “atmospheric depression” over Greenland.

An American friend of mine, Remi du Bois, was kind enough to volunteer to go to Goddard Space Flight Center to take a look at the ATS III images. It turned out that NASA had hardly any ATS III images left.

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Eventually I contacted one of the chief scientists on the project. It turned out that he had single-handedly saved approximately 1,000 ATS III images. NASA had ordered them destroyed because they had no meteorological value. A number of NASA employees had snatched up the few ATS III color photographs and taken them home. This scientist had kept approximately 1,000 at his home. My enquiry was the first in more than a decade. After lots of protracted wrangling it was arranged that Goddard Space Flight Center would take ownership of these remaining ATS III images and place them in an official archive. Remi went to spend five hours with this scientist poring over approximately 2,000 satellite images in all. The photographs had been moved to Goddard Space Flight Center and were located in the extreme back of the storage room numbered G90, in building 22. Remi and I were looking for holes in the Earth—but we didn't want to freak NASA out! We wanted a selection of photos from every angle over a period of time to establish what exactly this was.

The scientist was very nice and helped us a great deal. He said that he hoped we would use the photographs for a genuine purpose. He told me that he had once given out a photograph where a speck of dust on it had been misrepresented as a "UFO base" or something of that kind. He wasn't keen on "getting burnt" again! He very kindly gave me 20 free photographs which were more or less duplicates of others since the satellite took photos at 20 min intervals. I was very pleased and greatly indebted to NASA for their kindness.

Plate 13 shows the view of the Earth which ATS III has. The red triangular shape at the top is Greenland. It lies exactly at the top where the "hole" is.

So one is really looking at Greenland. One of the reasons for checking closely was to ensure that there was nothing funny as regards the curvature of the Earth. Remember Marshall Gardner's views that the Earth curved abnormally from a latitude of 80° North?

When Remi chatted to the NASA scientist he asked what this feature was. The NASA scientist referred to it in vague terms as colliding fronts of air which then spin. He thought the "hole" was a region where the moisture had been extracted from the air, and therefore we were looking at an area which was devoid of cloud—hence the "clear air." He ended his explanation with the words "I think."

It sounded like a rather strange explanation. How could moisture be so

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thoroughly stripped from out of the atmosphere to form a circular region of clear air?

Remi also began wondering if this NASA scientist was busy looking for something strange on the Earth! While he and Remi were going through the 1,000 ATS images and the 1,000 other miscellaneous images, also from old satellites, Remi noticed a huge 20 in copy of that Apollo 16 satellite image which we discussed earlier. It seemed so out of place. What the heck was it doing in that collection? So we wondered whether he too had an obsession for strange circular atmospheric features—but we never asked!

Dr. Gordeev's explanation didn't make any sense to me either. The reference book he had used referred to it as an atmospheric depression over Greenland. I couldn't buy that. How could a low pressure area physically deform the atmosphere? The atmosphere is a thin skin over the planet's surface. There is no way that it can be "dented" enough to affect the curvature of the Earth. This is an argument I used earlier with regard to Venus and its possible Polar Hole. And I stand by that.

So we were uncomfortable with both answers. But the answer presented itself once we had a chance to look closely at those 20 photographs so kindly given to us. ATS III was moved on several occasions by NASA to a new position. Sometimes it lay at a longitude of 50° West (Eastern Brazil) and at other times at a longitude of 80° West (Western Brazil). Plates 13 and 14 will give you an idea of how ATS III viewed the Earth from these different longitudes.

Let's take a look at some of the photographs given to us so kindly by NASA. The first of these were taken almost 2 years after Plate 12. In Plate 15 one can see the characteristic depression feature right at the top. There's even a nice clear hint of shadow on the right. The "hole" is surrounded by cloud and is not as pronounced as in Plate 12, but it's clearly still there.

The next day, ATS III still photographed it. See Plate 16. The essential feature making it up is still present. On this day we can even see clouds swirling around the outer perimeter of the "hole." Are they being sucked inside?

There's definitely something there. The next photo I have is for 8 Nov 1969. See Plate 17. You can just barely see it, but it looks a little strange—not quite as much of a "hole" as it appeared before. The next day it was much more pronounced. See Plate 18. NASA even took close-ups of the Earth later the same afternoon. See Plate 19. It's right there in the top right hand corner.

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You can see it's still exactly the same feature.

We are definitely dealing with a physical feature. The clouds are moving but the "hole" remains in the same position for weeks, and apparently even years.

The next set of photos I have is for March 1970. Look at Plate 20. We see a clear flat polar ice cap but no "hole." ATS III has now been moved, and it is now above Western Brazil. The "hole" is still there—but it's not as obvious now. It lies on the top right hand side of the ice cap. The next day's image is in Plate 21. Here you can see a squarish feature in that area with high and low level cloud. By the 23 Mar 1970 it's looking slightly more pronounced. (See Plate 22.)

In May 1970 conditions are still the same, except some low-level fog seems to be in the area. Look at the photos taken from the 2–5 May 1970. (See Plates 23, 24, 25 and 26.)

But where was the "hole" during those months in 1970? It was there during 1969, but not during 1970 —at least not in any form which would make you think you're looking into the Earth. Let's look at Plate 18 again. Notice how small the "hole" is? The bottom right hand corner of the "hole" is always slightly "longer" than the bottom left. And it's sitting there right in the top, center of the Earth. That's it. We were looking at Greenland all the time! Look at the topographical image of Greenland in Plate 13. Greenland is colored red. That is because red is reserved for the highest mountains on Earth. Look at the Rockies in North America and the Andes in South America. Only small sections of these mountains are pure red. But Greenland is all red. That is because Greenland, like Antarctica, has an enormous ice sheet on it. Snow has covered the mountains, and the mountains lie buried under ice and snow kilometers thick. All this ice is also having an effect on the weather. Perhaps the ice is cooling down the air, and perhaps the colder, denser air is driving winds which are blowing away from the Greenland ice cap. That's my guess. Hence, Greenland is always surrounded by a small margin of clear air. Greenland is foreshortened since it lies near the limb of the photos. The net effect is something similar to what one would have expected if one were seeing a gigantic crater. Look at Plate 15 again. I could swear I see a "shadow" on the right hand side of Greenland. This seems to be nothing more than clear ocean. If you go over all the ATS images again you will be able to clearly spot Greenland in each of them. Greenland's ice cap is definitely having an effect on the weather. The low pressure zone which Dr.

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Gordeev spoke about lies to the south east of Greenland. This “depression” which we have seen all along is in fact Greenland with the ocean to the east of it.

Mike Campbell, who is a meteorologist from the Newfoundland Weather Center explained the phenomenon to me as follows:

“I am a meteorologist working in Gander Newfoundland. We often call depressions just south and to the east of Greenland ‘Icelandic Lows.’ The low pressure centers which pass through Newfoundland usually end up there; a sort of graveyard for lows.”

He went on to mention “lee troughing” which takes place “under strong easterly circulations.” It seems as if this is the cause of the clear air off the east coast of Greenland.

Look at Plate 12 again. One could swear that the “lip” of a crater is visible, nice and circular, along the bottom of the image. But it’s nothing more than air currents flowing along the southern coast of Greenland.

So there you have it. The effect over Greenland is nothing more than an optical illusion created when ATS lies at approximately 50° West longitude. The NASA scientist had told us about another satellite (GOES) which replaced ATS III. It was permanently positioned far to the west of Brazil, and so one never saw any of these effects in those images.

I don’t like resorting to optical illusions as an explanation, but in this case it is a truly incredible coincidence. Imagine an optical illusion occurring in exactly the same position one happened to be looking for a gigantic hole leading into the center of the Earth.

In my many attempts at finding answers to all these features in these photographs I had a few interesting experiences which are perhaps worth relating.

Many months earlier I had faxed that retired NASA gentleman who goes around the world doing presentations of space photographs. An employee at Johnson Space Center referred me to him. I told him that I had a weird photo (at the time when I only had one) seemed to show what looked like a “crater” at the top of the Earth. I sent him a copy and asked him what it was. He did not bother looking at the photo but instead wrote a nasty reply saying that there are no craters at the top of the Earth. Then he lectured me about “people like me with a story to tell.” And he proceeded to tell me that he had spent time working with the USAF flying all over the Arctic and that there was nothing mysterious at all in the Arctic. In a fax to him I managed to reassure

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him that I had not lost my mind—not yet anyway! In his next letter he said that I would need more than one image if I wanted to present a scientific case for a crater in the top of the Earth!

Well, I'm right—sort of. ATS III produced thousands of photographs like this and many people were fooled by it. And as you can see, even competent and sceptical scientists had a hard time trying to explain this—or tried to avoid the issue. If he was so sure of his case then why didn't he just look at the photo and answer the question instead of ranting about "people like me?"

Even though ATS III turned out to be much ado about nothing, there were silly things which happened which certainly raised my eyebrows. For example, when I first ordered that color image from Johnson space center they sent me the eight inch print but with the top chopped off! Yes, the very thing I wanted to see, the "hole" was very neatly chopped off. In fact, it happened twice. I faxed them, gave them a piece of my mind and asked them not to chop it off! The next print, sent free of charge, contained the full Earth. That only served to fuel my more paranoid instincts. Of course, looking back it was obviously purely an accident on their part, but nevertheless quite an amazing coincidence.

I know absolutely nothing about satellite photograph analysis. So when first faced with this ATS III image I thought of approaching Richard Hoagland and his team. He and his team had made much of their "Face of Mars" analysis. Since they were acclaimed as "experts" I contacted them. Imagine my surprise when they just washed their hands of me, not even daring to show one ounce of interest. The best they could do was refer me vaguely to some scientist in New York whose telephone number they weren't sure of. They only did this after I had hounded them for some time.

One would have thought that there can't be many folks like me sending them photos where the object of interest is so vast, so obvious and so strange. Surely they would have, by natural curiosity alone, jumped at the chance to prove me wrong or right as they saw fit. But the sheer lack of interest on their part left me quite astounded.

I had assumed, incorrectly I suppose, that here they were, a "photographic analysis Dream Team" and they'd quickly put my image on their computer, pronounce their verdict and off I'd go.

Then there was another "scientist," also busy with a project to do with Mars who told me he could do the same as Hoagland *et al.* So I jumped at the

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chance. Then he told me how the U.S. Government was hounding him and threatening him. I began to get suspicious about him. I really began wondering about his credentials. When I gave him an ATS III image to look at, he immediately pronounced that there was an “external object” flying around the Earth. This was the result of his computer analysis. Meanwhile I had specifically asked him to look at this “feature” at the “North Pole.” The external object turned out to be a scratch on the photo. And yes it really is a scratch because I had the original 8 inch print in front of me. It was true, just as that NASA scientist had said, that some people come along and take something out of context and misrepresent it. Some strong words from me followed because someone else was quite ready to rush out and spread the word about this strange object on this ATS image and make copies of it. This “scientist” is busy writing a whole lot of hogwash about some other feature on Mars which will no doubt start another pointless controversy about nothing. He is going to try to convince you that he found a city on Mars. If my experiences with him are anything to go by then I very much doubt that!

I’m presenting a very weird idea in this book, but am doing my level best to go about it as analytically and as responsibly as I can. I truly hope you do not see me as “one of those people with a story.” I really feel I have something valid to contribute, and I hope my final conclusions will prove that to you beyond all doubt.

ASTRONAUT INTERVIEW

One of the members of my Internet list works for Bavarian Radio. In May 1997 he interviewed Dr. Ulrich Walter, a former space shuttle astronaut in preparation for a program about the Hollow Earth. The interview was given in Oberpfaffenhofen, Germany, in German. Mr. Xaver Fruhbeis who conducted the interview also kindly translated it for me, and gave me permission to quote parts of it. Mr. Fruhbeis asked questions relating to the Hollow Earth. Among the questions was whether astronauts in the space shuttle would be able to see anything from their vantage point in their equatorial orbit?

> **WALTER:** Okay, you should be able to see such a hole when astronauts fly around in space, and secondly, on satellite photos. I personally did not see any hole. I am a member of the ASE (Association

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of Space Explorers), and I do not know of any astronaut at the ASE, who speaks about this topic or has said he has seen such a hole. This topic is not known there.

WALTER: On the other hand, it depends on how far in the north such a hole is said to be. The shuttle does not scan all possible locations on Earth. Just the most northern parts are not covered because that would require a lot of fuel. So if the hole is supposed to be in the utmost north, no space shuttle astronaut could have been able to see it. Exception: If the hole is big enough so that you could look into it from the side.

Mr Fruhbeis then showed him a photo from EAS 1, a Radar satellite, that had missing data at the pole:

WALTER: That is not right. I will show you data from EAS 1 without that missing data hole.

Walter then showed Xaver some photos, but there was a “data hole” on them too. Walter was surprised. He called some experts to get an explanation for it.

WALTER: The explanation is that it has something to do with photograph and camera techniques. Those data cameras cannot not take photos vertically downwards. They do it slightly to the left or to the right. That’s why there is a data hole directly at the North Pole. And when taking optical photos at the North Pole, it might happen that there is night half a year in that region so you cannot take photos. That results in a hole at the pole.

The explanation is very similar to the one I advanced for the ESSA photographs. Dr. Walter replied to questions regarding a central Sun:

WALTER: If there was a Sun inside Earth and holes at the poles, you must be able to see the reflections of the light coming from inside on the lower side of the clouds at the polar regions. You ought to see kind of light clouds at night. Nobody has seen that yet.

WALTER: There were many submarines crossing the North Pole underseas. How would that have been possible with a hole at the pole?

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Dr. Walter's testimony is another blow to the idea of gigantic Polar Holes. But if the hole is small enough, and if it is situated far north enough then it won't be seen from the space shuttle. The space shuttle, and other Earth orbiting space craft often orbit at altitudes of under 1,000 miles. Some space shuttle missions orbit at an altitude of 350 miles. One can calculate the distance which they can see from this vantage point. The Earth's polar diameter is 7,900 miles. One has to be a considerable distance from the Earth before one can see the poles from a space ship. Only the Apollo astronauts have ever been that far away from the Earth. As we have seen, their photographs do not show any Polar Holes. But returning to the space shuttle, it is worth remembering that rockets make use of the Earth's rotation to help launch a space ship. Thus all these craft orbit the Earth in a more or less equatorial orbit. These craft almost never go to very high latitudes. There have certainly never been polar orbiting
which have had humans on board.

MYOPIC SATELLITES

One can't help wondering if scientists stumble upon things which they write off as bad data but which might not be. Remember that a satellite is limited in the data it can return. It can only look for, and report on the things it was designed for. These parameters are often very narrow. We must therefore be careful in drawing broad inferences from experiments which have extremely narrow parameters.

Consider for example the Viking missions to Mars in the 1970s which were supposed to determine if there was life on it. There were three experiments involved. At first it was said there was no life on Mars. Later, as the years went by, a number of scientists went back and debated over the exact meaning of these results. Some were of the opinion that these results really showed there was life on Mars. Does Mars have life on it now? We don't know because the results are open to various interpretations.

I wish to emphasize the limitations of these highly sophisticated machines. They are often designed for very specific tasks and if the reality were to be very different then these machines might miss something very crucial and end up misleading us.

Take for example the discovery of the Ozone holes. Scientists never expected such a phenomenon, so its discovery occurred purely by accident.

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Consider this admission regarding the belated discovery of the Ozone hole:

> An urgent reappraisal of existing data revealed that the hole would have been discovered earlier **if the computer analyzing US satellite observations had not been programmed to exclude very low readings as misleading anomalies.**[5]

Here is another example of computer intervention. Remember Prof. Iosif Shklovsky who speculated in the 1950s that Phobos and Deimos might be hollow? Consider what happened to Dr. Carl Sagan in the 1970s as Mariner 9 photos were being sent back and he was watching these new images. He wrote:

> Our computer enhanced photograph was constructed on the computer's video monitor, line by line, from top to bottom. As the apparent large crater at the top gradually emerged, we saw a single bright spot at its center, for just a moment, **I had the sense that we were seeing a star through an enormous hole in Phobos—**or, even more chilling, that we were seeing an artificial light. **But when we requested the computer to remove all single-bit errors**, **the bright spot went away** .[6]

Note how this extremely bright spot was removed by the computer software because it was regarded as an "error."

The polar regions of Venus can be extremely bright when seen from Earth. But when viewing NASA photographs one does not get the same impression. In the polar regions of Mercury, astronomers record anomalous brightening. Later, earth-based radar shows there may be ice on Mercury. There is a whole history of sightings on Mercury going back decades which strongly suggest polar ice caps alternating with violent dust storms. But where was all this ice and dust when Mariner photographed Mercury in 1974? How is it possible that astronomers from the Earth can possibly see huge dust storms and even enormous ice caps on Mercury, but on NASA photographs Mercury is as pristine as the Moon?

Similar things may be happening here on Earth. Satellites may be flying over a Polar Hole but anomalous lighting may be regarded by the computer programs as erroneous data and it may then be "corrected" and subsequently lost.

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CONCLUSION

My conclusion is really not surprising at all. The Reader probably came to this conclusion even before reading this chapter. But, there is one difference. I was open-minded enough to examine this strange possibility in detail before rejecting it. And that, I believe, is a better and more scientific approach than just rejecting the concept out of hand. I cannot find one ounce of credible evidence to suggest the existence of:

1. Any gigantic Polar Holes here on Earth.
2. The existence of a small Polar Hole exactly at the geographic North Pole (or even South Pole for that matter).

Marshall Gardner and others said that the North Pole did not exist. According to them it was merely a mythical place in the middle of a hole centered on the geographical North Pole.

I may be gullible, but I also do want decent answers to my questions—no matter how stupid they may appear to others. As open-minded and as gullible as I am, I truly think we can lay the gigantic holes idea to rest, at least as regards the Earth.

A fool can ask more questions than a wise man can answer. But, I'm not just asking strange questions to try to befuddle the wise men. I have what I believe are valid reasons for asking these questions.

Some good has come from all this nonsense of mine. We found ATS III images which nobody knew existed, and they were repatriated back to Goddard Space Flight Center. We also discovered the proper explanation for the mysterious feature seen in the ATS III images. We can also lay to rest all the nonsense produced by the NASA winter montages and show that NASA wasn't hiding anything from anyone—at least not on those occasions!

This exercise, along with the astronomical observations mentioned earlier should demonstrate to people that we need to be more aware of the images which come back from space. We should pay more attention to detail. Important facts may be staring us in the face.

The strangest and most interesting results however will never reach us because the computers will be automatically removing data which is believed to be erroneous. This raises the serious possibility that satellite probes also have their own short-comings. Currently, satellite data is always considered

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to be superior to telescopic data. However, since the satellites are designed with a built-in myopia they only record things within the ranges expected of them. This raises the interesting possibility that certain telescopic observations might actually be more objective and closer to reality than the satellite data which is currently regarded as holy writ.

Having set ourselves free of the invalid ideas of the past regarding gigantic Polar Holes on Earth, let us now reconsider the problem of Polar Holes from other angles. Dr. Walter’s testimony does not exclude the existence of small Polar Holes existing beyond the Arctic and Antarctic circles.

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Chapter 14: Religion and Legends

Let me state clearly that this chapter is by no means a comprehensive report of any kind on legends or scriptures. There is much more out there than I am going to mention here. In this book I have concentrated my efforts upon science. However, I want to show the Reader that there may be a few gems of truth hidden in folklore and religion which may assist us in our quest. The legends which emanate from South America; the Hopi Indians of North America; the Eskimos, etc would fill many books. But I will leave that subject for others to look at. The question I pose here is whether some religious scriptures and folklore could be based partly on physical fact?

It is easy these days for people to accept that our forefathers were untrustworthy. The old people of various tribes, nations and religions have gone to great lengths to preserve certain knowledge which they deemed to be useful. I find it hard to believe that they were all liars, or that their aims were deceptive from the beginning. Many of these religious leaders from all cultures were very pious people filled with goodwill and love for their fellow man. I find it hard to believe that they deliberately set out to deceive all the generations which followed them. They may have drawn wrong conclusions or misread facts on many occasions. Their work might have been error-prone. However, some of their works may be founded upon a more solid basis than we believe. They may have experienced certain things, or seen certain things which they thought were worth recording for posterity.

Many people believe in a great spiritual God, in a super-natural being who owns the universe. But many religions also provide us with hierarchies of lesser “gods” who seem to be physical in nature. Could the references to these many lesser gods perhaps be references to other civilizations and their rulers? Religious scriptures from around the world constantly tell us that we are not alone. They tell us there are all manner of living beings (e.g. Angels, Cherubim, etc.) and gods which reside in the universe along with us. Some of these gods are said to have walked among us. Many of the gods of ancient times lived in specific places (e.g. mountain tops). A few of them even lived inside the Earth. Were these gods real?

Most thinking people these days have come to the rational conclusion that it is theoretically impossible for us to be alone in the universe. The old

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belief that we are alone in the universe is logically unsustainable no matter from which angle you look at it. It requires us to believe that somehow, this one tiny speck of dust called Earth, is an aberration, a total departure from the norm in a universe of infinite size. A recent *Time*/CNN internet poll showed that 80% of people believe that we cannot possibly be alone in the universe. Any serious astronomer would agree with that assessment.

Some of these religions and legends go further by telling us that we are also not alone here on the Earth either. They inform us that there are animals, devils, gods and even people who live deep beneath the surface of the Earth. There is one God who is said to live at the center of the Earth. We have tended to discount all these tales because our understanding of gravity caused us to conclude that a vast torrid zone lay deep beneath the surface of our world. Let us take a quick look at a cross-section of interesting legends and scriptures.

Dungeons and Dragons (D&D) is a popular role playing game these days. Where does the idea originate from? Folklore of course. This folklore holds that strange creatures and variations on the humanoid theme live deep inside the Earth. Dragons sleep quietly in their tunnels and caverns for centuries, disturbing no one, until attacked by small groups of so-called "heroes" who kill them for their gold. Dwarves have always been associated with mines and tunnels. We have a mythology of leprechauns, goblins and many incredible creatures too numerous to mention which supposedly live underground.

There is an extensive mythology of strange creatures which continues to plague us right up to the present time. Across the world, on every continent, the same story is heard over and over again. Some strange creature of a particular species is seen over a period of centuries in the same limited geographical area. The species vary (e.g. Humanoids, wolves, cats, dinosaurs, etc.). But the pattern is always the same. A specific type of creature is linked to a very limited geographical area. Searches conducted for it always come up empty-handed. Then people discount it. Just when everyone is sure it was all a figment of their imaginations a new credible sighting starts the whole cycle all over again. This pattern repeats itself every few decades and continues for centuries.

This key issue of "limited geographical area" suggests to me that we are dealing with a specific type of creature which has found a cave or tunnel of some kind where it lives and from which it exits from time to time. Now

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whether such creatures can actually feed elsewhere underground, raises new issues.

Perhaps the answer is to plot all such sightings on a map, and to carefully note the directions in which the creatures are seen moving. Based on this, perhaps someone could determine the central point from which such a creature comes out of the Earth, perhaps through a tunnel which is hidden by vegetation. One only has to look at the story of the Dead Sea Scrolls to know that caves and tunnels can be hidden in well populated areas for centuries without being found.

Similarly, one finds accounts of highly elusive lake monsters from around the world. Remember the monsters swimming around in the vast underground oceans in Jules Verne's *Journey to the Center of the Earth*? Could the subterranean approach be the solution to the problem? What if some of these "lake monsters" originated from a primarily subterranean environment? What if they had many underground feeding grounds and habitats? What if they only occasionally exited into a lake here on the surface and remained in it for a short time before returning to their real home? That would explain many things. It would explain why these creatures are so rare. It would explain why scientists can sometimes find them on sonar while at other times they cannot be found at all. It would explain why we never see their young. It would explain how entire herds of such creatures could remain hidden. It is obvious that no species of animal can survive for centuries by itself. There must therefore be a population large enough for them to breed and to raise their young. So where are these herds? Or are they all living in some underground lake or ocean fed by fish which also live there?

All these strange land, lake and sea creatures have spawned the fragile but growing science of cryptozoology. In recent decades more and more zoologists are coming to believe that there are many highly elusive creatures which still remain to be discovered. There are credible and amazing reports originating from serious scientists and biologists who have been on the track of these creatures. A few of them have even seen these creatures close hand. Prof. Roy Mackal of the University of Chicago is one of the tireless scientists who has been trying to track down some of these impossible creatures. His successes, and his personal experiences in this regard have not received the attention they deserve. The German zoologist, Dr. Karl P. N. Shuker recently wrote an excellent book on cryptozoology called *In Search of Prehistoric Survivors*. On page 89 he tells us of this encounter with the Loch Ness

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monster:

> . . . in September 1970, Prof. Roy Mackal and two colleagues aboard their boat spied a huge beast about 30 ft away, rolling underwater in Urquhart Bay." Later, Dr. Robert H. Rhines produced some stunning photographs of a strange underwater creature in the 1970s. It includes a spectacular photograph of a flipper which has puzzled zoologists ever since, because there is no known creature in the animal kingdom with a flipper of this structure.

Cryptozoology has grown considerably, and most of its achievements and literature has gone unnoticed by the general public and the mass media. This is very sad because there are a great many experienced scientists from around the world who have contributed to this science. Some of their reports, evidence and personal experiences will amaze you.

In cryptozoology it is easy to believe that the Earth's oceans are so vast that a number of species of animals may exist in them undetected. However, when dealing with land animals and with lake monsters this option is not open to us. Instead, I have been wondering if some (but not all) of these elusive land and lake creatures might emanate from underground sources. This is an idea which remains untested.

Moles and rabbits burrow underground. This is understandable. But can larger creatures actually live underground in sparse habitats created by ancient volcanic activity or by past and present underground streams? Consider this: if temperatures and pressure do not necessarily increase ad infinitum with depth then perhaps rivers, lakes, and even oceans might exist deep inside the Earth. Given a supply of oxygen (by way of volcanic vents), and water, we already have two of the major components needed for life to persist underground. Subterranean creatures would also have the advantage of not having to deal with harsh winters since it should generally be warm down there. All that is needed is that they be able to survive in the dark. Bats have no problem living in dark caves. Could other creatures have evolved similar abilities?

I admit that the idea of subterranean zoology poses lots of problems. The dark alone, is a major problem. I say that because of an experience I had trying to retrieve my car from an underground parkade one night after the lights in the building had been switched off. What a nightmare it was having

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no light and finding that I could hardly walk straight over a distance of even a few yards and that my normally good sense of direction was utterly worthless. Unless all these creatures operate as bats do, or carry some form of natural lighting with them, I do not see how they could live down there. Some creatures are luminous such as fireflies and species of fish which live in eternal darkness deep in the oceans. So perhaps some kind of biological luminosity cannot be ruled out.

Then too, there are creatures like cats, who have incredible eye-sight and who are quite comfortable in the dark. Of course, the total darkness of tunnel systems is very different to the darkness of a starry night. But we should never underestimate what nature is capable of.

Food would be another major problem. But fresh and saltwater fish have sometimes turned up deep inside bore holes and wells far from the sea. What if subterranean streams acted as underground watering holes? What if creatures sought out these places, just as the lion goes in search of buck at the local watering hole? These problems might not be as insurmountable as we think. Nature has often surprised us in the past, perhaps we should be prepared for new surprises.

Creatures live in all sorts of improbable environments. Some can live quite comfortably in an icy hell, while others live in conditions akin to those found in a boiling kettle. There are even bacteria which seem to have survived the extreme temperatures of space, in a virtual vacuum. So let us keep our minds open to new possibilities.

THE HYPERBOREANS

Pliny was born in 23 AD in Italy. He became a distinguished public servant and a friend of emperors. At night he labored on many enormous works. One of them was a 37 volume *Natural History* which he boasted contained 20,000 facts gleaned from 2,000 volumes. Pliny believed the Earth was spherical.

Pliny wrote of strange places, people and animals. One of the tales he relates is similar to that believed by the Greek people. He wrote that in the woods and groves beyond the north wind there lived the one-legged Hyperboreans. Their land was an earthly paradise with caressing airs and golden fruit. They also did not die. They made way for the next generation by holding a banquet and then promptly committed suicide by jumping off a

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certain rock into the sea!

In those times it was believed that the north wind came from the Rhipaean Mountains in Europe. The land of the Hyperboreans was therefore thought to lie somewhere north of this. Christopher Columbus was supposedly in the habit of speculating on the classic literature regarding the Hyperboreans.[1]

Could these references to the Hyperboreans be a reference to people who live beyond the North Pole —perhaps even inside the Earth?

WESTERN RELIGIONS

Let us examine some religious texts which form the core of major religions. There have been many pseudo religions which are not linked to the major belief systems of our world. We will ignore these. I would encourage the Reader to look at Kafton–Minkel's work. For example, one of those who perverted all ideas to suit himself was an American charlatan named Cyrus Teed. In the late 19th century he taught that he was the second Christ. He also taught that the Earth was hollow and we were living inside it. Teed made things up as he went along. There was also a German occult movement which believed we live on the inside of a Hollow Earth. We will ignore rubbish such as this, and look at scriptures from genuine religions.

The Bible mentions that Satan was cast into a great pit. Hell, so it seems, lies inside the Earth. But even within a religion there are different unofficial "sub-beliefs" fuelled by the scriptures. Halley was a religious man. After he started this Hollow Earth business, some prominent Christians have from time to time wondered if perhaps the Hollow Earth could provide the solution to a number of Biblical problems. An early Christian supporter of Halley was Cotton Mather. In his *Christian Philosopher* he mentioned Halley's concentric spheres theory.

Another group of Christians with an affinity for the Hollow Earth theory are the Mormons. The Hollow Earth theory is not official church doctrine. But a number of Mormons have been struck by certain references in their scriptures to the Arctic. The Mormons have some scriptures of their own, produced by their founder Joseph Smith. The Bible tells us that when Shalmanezer overran the Kingdom of Israel he took the ten tribes comprising that kingdom into captivity in Assyria. Afterwards these ten tribes were led into the lands of the far north. They have since been referred to as the ten lost

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tribes of Israel because nobody knows where they went and settled.

In the apocryphal book of Esdras, it mentions that they "shall go forth into a further country, where never mankind dwelt" (Apocrypha 2 Esdras 13:40–47). The Bible clearly states that they headed far northwards. Official Mormon doctrine teaches that they firmly believe the Ten tribes of Israel will return one day. But where from? The Mormons believe that God has somehow hidden these tribes from us. A very few of them have proposed that the Ten tribes might have disappeared into a Hollow Earth, and that it is from here that they will be returning one day. In the *Doctrine and Covenants* of the Mormons, there is a reference to the return of these tribes. It mentions the sea bed drying out, and a highway being prepared from the north which will facilitate their return.

There are more explicit references to subterranean life in the Bible. In Philippians (2:10) we find this reference: "That at the name of Jesus every knee shall bow of things in heaven, and things in Earth, **and things under the Earth."** The quote from Philippians mentions that knees of "things" (creatures?) shall bow. These "things" are all alive. Among these are included the "things" which live **"under the Earth."** Is this a reference to subterranean life?

In the book of Revelation (5:3) we find a similar statement, but this time it specifically mentions subterranean humans: "And no man in heaven, nor in Earth, neither under the Earth, was able to open the book, neither look thereon." The suggestion here is that there are also men "under the Earth."

A gentleman by the name of Paul Davault contacted me one day to inform me that he had done a comprehensive study of the Bible to see whether there were any Biblical references to a Hollow Earth. He did this as an exercise for his friends and family. He ended up writing a book called *On The Face Of The Deep*. The following quotes were supplied to me by Paul Davault.

In Matthew (12:39) it states: "But he answered and said unto them, An evil and adulterous generation seeketh after a sign; and there shall be no sign given to it, but the sign of the prophet Jonas." So what is this sign of the Jonas? In Matthew (12:40) we read: "For as Jonas was three days and three nights in the whale's belly; **so shall the son of man be three days and three nights in the heart of the Earth."** Davault notes that "Kardia" is the Greek word that was translated as "heart" in this verse. He thus believes that Jesus spent three days and nights inside the Earth. Davault goes on to mention that

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Jesus refers to this place as “Eden” which means paradise.

Which raises the question: where is the biblical Garden of Eden? In Christopher Columbus’s time it was rumored to lie in Asia. Columbus believed this and he hoped to find it! A few Christians have thought it might be located inside the Earth. As will be seen, there are scriptures in major Eastern religions which state that a paradise exists inside the Earth. Davault suggested, on the basis of his studies above, that perhaps the Garden of Eden is located inside the Earth. He also suggests that the Bible tells us Jesus went there.

In Ephesians we find this strange reference to Jesus. Ephesians (4:9–10) reads:

> Now that he ascended, what is it but that **he also descended first into the lower parts of the Earth? He that descended is the same also that ascended** up far above all heavens, that he might fill all things.

Davault told me he believes the following reference indicates the existence of a Polar Hole in the Arctic. In Job (26:7) in the Old Testament one reads: “He stretcheth out the north over the empty place, and hangeth the Earth upon nothing.”

In the Book of Enoch (76:6–7) we read:

> Seven rivers I beheld upon Earth, greater than all rivers, one of which takes its course from the west; into a great sea its water flows. Two come from the north to the sea, their waters flowing into the Erythraean sea, on the east, And with respect to the remaining four, they take their course **in the cavity of the North**, two to their sea, the Erythraean sea, and two are poured into a great sea, where also it is said there is a desert.[2]

In 1886 William F. Warren published a book called *Paradise found: The Cradle of the Human Race at the North Pole*. He quoted the following from a translation by A. M. Sayce, of a book called *Records of the Past*:

> We are told of a dwelling which ‘the gods created for’ the first human beings—a dwelling in which ‘they became great’ and ‘increased in numbers,’ and the location of which is described in words exactly corresponding to those of Iranian, Indian, Chinese, Eddaic and Aztecan

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literature; namely, **‘in the center of the Earth.’** (Pg. 240)

Does the Garden of Eden exist inside a Hollow Earth?

ESKIMOS AND INDIANS

Knud Rasmussen, in his *The People Of the Polar North* (1908) relates an Eskimo story about the creation as told to him by an old woman named Arnaluk. According to the legends she related:

> That time, very long ago, when the Earth was made, it dropped down from above—the soil, the hills and the stones—down from the heavens; and that is how the world came into existence.

In a sense her description of the “creation” is technically correct, the Earth probably did condense from matter “in the sky.”

She went on to state how people were created: “When the world was made, people came. They say that they came up out of the Earth. Babies came out of the Earth.”[3] It becomes clearer that what she meant was that people sprang up out of the Earth, and that dogs rose out of tiny little mounds like vegetables. The Hopi Indians in North America refer to this as the fourth world. There are legends among them which suggest that people originated from a world inside this one.

Before I started writing this book I was going through all the Arctic books in the Johannesburg Public Library. I wanted to know if the Eskimos had anything to say which might suggest the Earth was hollow. I happened upon an interesting Eskimo legend which seemed to originate from the west coast of Greenland. It came from an Arctic traveller who made friends with the Eskimos.

I write the following from memory since I cannot remember the name of the book in which I happened upon this legend: An Eskimo got into his kayak and paddled off into the sea. When he failed to return, his wife wondered whether he had perhaps gone into the “hole in the sea.” The legend gave no indication of the location of the “hole in the sea.” But it did mention that the fishing in the “hole in the sea” was very good. Earlier this century Marshall Gardner had noted the tremendous amount of fish and whales in the Arctic. He questioned why there should be such an abundance of life in the polar regions. Shouldn’t there be more fish near the equator where it is warm than

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in the cold dark waters of the Arctic? Marshall Gardner wondered if these fish came from an ocean inside the Earth.

Eskimos don't dive into the cold water. The legend clearly indicates that the Eskimo could have paddled into the "hole in the sea" and gone fishing there. I know of no holes in the sea. It must be a very large hole for the sea to curve inwards like that. It sounds suspiciously similar to what one expects from the Hollow Earth theory.

THE KING OF THE WORLD

There are some ancient texts which suggest that a super-civilization resides inside the Earth. The ruler of that civilization is known as the King of the World.

An Indian gentleman living in New Delhi, India sent me an e-mail one day, saying that Hindu scriptures specifically mention the existence of a vast underground civilization.

Generally speaking, Greek mythology of the classical period taught that there was an underworld of the dead, ruled by Pluto. In Plato's *Phaidon* we see the first ever mention that the Earth is round. But *Phaidon* also mentions "passages broad and narrow in the interior of the Earth." It talks of hot and cold springs and of rivers inside the Earth.[4]

In Chapter IV of Plato's *Republic* he tells us of a "God" who lives inside the Earth:

> 'What, then,' he said, 'is still remaining to us of the work of legislation?'
>
> 'Nothing to us,' I replied; 'but to Apollo, the God of Delphi, there remains the ordering of the greatest and noblest and chiefest things of all.'
>
> 'Which are they?' he said.
>
> The institution of temples and sacrifices, and the entire service of gods, Demigods, and Heroes; also the ordering of the repositories of the dead, and the rites which have to be observed **by him who would propitiate the inhabitants of the world below. These are matters of which we are ignorant ourselves**, **and as founders of a city we should be**

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unwise in trusting them to any interpreter but our ancestral deity. He is the god who sits in the center, on the navel of the Earth, and he is the interpreter of religion to all mankind.

Who is this God, this Ancestral Deity who sits at the center, on the navel of the Earth, who has brought religion to all mankind? Is he a physical being? Who are the inhabitants of the Earth below?

Far away from Greece, in Asia, the Buddhists also speak of this God who lives inside the Earth. The Buddhists have a huge underworld, a veritable Underground Empire called Agharta. Its capital city is Shamballa and its ruler is known as the King of the World. Here too we have hints of a "God" who lives inside the Earth and who watches over all who inhabit both the outer and inner Earths.

Some Westerners have attempted to find the location of this Underground Empire. One was Nicholas Roerich, a Russian. Another who actually thought he'd found it was a German traveller, Theodore Illion.

Could it be that Plato is right and that the great religions of the world were perhaps founded in some way with the help of the ruler of a vast Underground Empire? Would this explain the strange Biblical references to Jesus descending?

Are we the only inhabitants of planet Earth? Are we the sole owners of this planet or are we perhaps only tenants on a planet owned by someone else more senior and more powerful than us?

When it comes to underground kingdoms, the belief is nowhere stronger than in Tibet. It is said that some Tibetans believe that the First Dalai Lama of Tibet received his instructions from the King of the World.

I raised these issues with some people in the Tibetan Buddhism news group on Internet. One Tibetan Lama (Priest) who lives in Canada, told me that there was no such concept as the "King of the World" in Tibetan scriptures. The Buddhists, unlike the Christians, do not have a single book which is their "Bible." Their scriptures are vast and so establishing such facts are more difficult than one thinks.

The onus is therefore upon me to justify my stance that Tibetans, perhaps only in the past, did indeed have a fervent belief in an Underground Empire.

Tibet was a highly secretive nation for many centuries. The Tibetans were originally a very hardy war-like people who conquered all those around

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them. Then Buddhism entered their land. Soon the armies of soldiers became armies of monks. Their hardiness never left them however. They live in one of the most inhospitable regions on Earth. How they manage to survive in an elevated desert of rocks and mountains at the top of the world is itself an amazing story. The military discipline which once governed them has been replaced with a religious discipline every bit as tough. In Asia, Tibet enjoyed a position almost similar to that of the Papacy in Rome.

When the English and other European nations began trading with the East, the Tibetans decided it was best to keep white men out of their country. They believed that these foreigners brought bad luck to them.

Amazing tales emanated from Tibet. There were strange stories from this land which was ruled by the Priesthood and whose Priests had strange powers. There were some Westerners who decided to go sneaking through this country to see what was really going on. It is to these extremely hardy and dedicated individuals that we owe our descriptions of Tibet before the Communist Chinese came and enslaved that nation, and destroyed its priesthood.

One of these travellers was a German, Theodore Illion. Illion tackled the task of sneaking through Tibet with typical Germanic thoroughness. In 1932 he began planning his trip. He left Germany in 1934 and returned in 1936 whereupon he wrote his *Ratfelhaftes Tibet*.

Illion could speak Tibetan fluently. He intended travelling in disguise. He planned to dress and behave like a Tibetan. He was to find that the ignorance of the common people was great and this helped him considerably in pulling this stunt off. The Lamas were however cleverer, and he did not fool them as easily. In their presence he would pretend to be deaf and dumb. Once in Tibet he was sometimes found out. But he was also fortunate enough to make friends with some of the Lamas who saw no harm in assisting him even though this was forbidden.

Since Tibet is a mountainous desert there was little point in taking beasts of burden with him. Sometimes one could travel hundreds of miles without seeing a single blade of grass. So Illion began practising the normal mode of travel in Tibet, walking. He began walking long distances. Then he began spending freezing nights in northern Scandinavia at many degrees below zero.[5]

Illion’s experiences in Tibet led him to believe that the Tibetans over-exaggerated when they spoke of an Underground City. Illion believed that he

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had indeed discovered the Underground City. In his introduction to *Darkness over Tibet,* Illion writes:

> The existence of an Underground City in Tibet is occasionally hinted at **by well-informed people in the forbidden country**, **although the stories are often extravagant and turn the Underground City**, **which I succeeded in entering**, **into a 'Mighty Underground Empire inhabited by millions of people.'**
>
> Tibet becomes somewhat more accessible as the years roll by, and I am confident that eventually explorers will confirm my description of the Underground City of Tibet.

Tibet did not become more open, instead, the Tibet of that time with its religious culture disappeared altogether. Saddest of all was the deliberate Chinese destruction of this strange religious order which fascinated so many and which had kept Tibet at peace for centuries. The brutal Chinese suppression of religion in that country is one of the darker events of this century. I also can't help but wonder what happened to Mr. Illion during World War II for one never hears of him again.

Illion therefore does not place any credence in the existence of an Underground Empire which has millions of inhabitants. But it does nevertheless demonstrate that back in the 1930s there was talk among the "well-informed" of Tibet about the existence of a vast Underground Empire "inhabited by millions."

Illion's City of Initiates, as he preferred to call it, was really nothing special. He does not mention its exact location but does mention passing through one of the side-valleys of the Sangpo Valley on his way there. He says it was located 20 mi from the nearest village. It was located at a place where the valley widened to approximately 400 yards across.

It can be likened to a sub-surface apartment building. It consisted of seven underground buildings arranged in a circle around a central hole—like a bore-hole. At the top of each building was a staircase which went down into it. And at the top were thick sheets of glass through which sunlight streamed. The rectangular patches at the top measured 40 yards by 40 yards. The buildings could easily be camouflaged if necessary. The railings and entrances could be hidden and sand could be strewn across the top of the

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glass.

While waiting to be received into the city, Illion investigated the central shaft. There was a wall around it, and he formed the impression that the shaft was extremely deep. He then took a 10 lb stone and threw it down to ascertain the hole's depth. But he never heard the sound of it hitting the bottom. He then threw a 20 lb stone down the shaft and listened carefully. After 35–40 sec he heard the sound of it scraping down the one side of the shaft but he never heard it strike the bottom. He was getting ready to throw a 30 lb stone down the shaft when a messenger bade him to please stop!

Illion lived in the city for quite a while. During this time he realized that several hundred people lived here. Life was very regulated and rigid. This city, although composed of Tibetans, does not seem to be in any way linked to the Tibetan Buddhist order or to the Government of that country. It seems to have been a strange religious cult which was extremely dangerous. At one point Illion feared for his life and that was when he made his successful attempt at escaping.

The buildings were several stories deep. How such a thing could have been carved out of rock is a puzzle. Perhaps it is of ancient origin? The strangest part of the complex was without a doubt the central shaft. Its incredible depth was a mystery. At one point Illion mentioned to his rich Tibetan friend, Narbu, that the shaft was very deep. Narbu replied "It is immeasurably deep, but no one except the Prince of Light and a few of the highest Initiates . . . know where it leads to. Anyone who would find out where it leads to and what it is used for would have to die. . . There are such secrets." The "Prince of Light" was the cult's leader, and Illion came to dislike him greatly. Illion could offer no further insight or guesses as to the function of this shaft.

I should emphasize that there was no talk of this "city" being linked to Agharta. Illion believed that this was Agharta even though the Tibetans themselves never claimed that. Narbu had referred to this as the "City of Initiates." The "Prince of Light" never claimed to be the "King of the World." It is Illion who came to his own conclusion that perhaps this was Agharta.

Illion decided to flee when he accidentally stumbled into the "kitchen" and saw them cutting bits of flesh off a corpse and cooking it. He had seen many human skeletal remains and had come to suspect that there was cannibalism going on there. When he saw the corpse being cut up he decided

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it was time to leave with the greatest of haste. It should be pointed out that Tibetan Buddhists do not eat meat, and this cannibalism is definitely an aberration by their standards. The cult derived its power and finances from a number of rich Tibetans who were caught up in it.

Illion's tale is the only one of its kind. His writing is very rational as he discusses many aspects of Tibetan life and as he makes his own observations of them. He seems to be level-headed and had not expected to stumble upon this strange cult. Illion's discovery has never been verified because of the changes which have taken place in Tibet since then.[6]

The tale of the extremely deep shaft is quite curious by itself. There have long been rumors of deep tunnels in Tibet which led to the Inner Earth. But whether this is in fact one of them is an open question.

It is Illion's confirmation that there really was talk of a vast Underground Empire of millions of inhabitants which is of interest to us. This talk had enough substance for Illion to believe it was a physical place.

Nicholas Roerich, who was a very famous cultural figure in his time, also confirms what Illion says. Roerich was born in 1874 in St. Petersburg, and grew up in an upper middle-class family. At an early age he developed an interest in archaeology and was also a talented painter. He travelled extensively, and had wide interests. Roerich believed in the unity of all religions. During the Russian revolution he was opposed to the Communists. He later founded the Master Institute of United Arts in New York. His wife also authored some books. He passed away in 1947.

At 319 West 107th St in New York city one finds the Nicholas Roerich Museum. Roerich believed that there might be some truth in the myths of the past. In the 1920s he and his wife travelled extensively through Tibet and many other Asian countries. In one of his books, *Shambhala* (sic), he discusses the concept of subterranean dwellers. Roerich writes:

> In every city, in every encampment of Asia, I tried to discover what memories were being cherished in the folk-memory. Through these guarded and preserved tales you can recognize the reality of the past. In every spark of folklore, there is a drop of the great Truth adorned or distorted. Not long ago we were too vain to appreciate these treasures of folklore."

He continues:

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> "Among innumerable legends and fairy tales of various countries may be found the tales of lost tribes or subterranean dwellers. In wide and diverse directions, people are speaking of the identical facts. But in correlating them you can readily see that these are but chapters from one story. At first it seems impossible that there should exist any scientific connection between these distorted whispers under the light of the desert bonfires. But afterwards you begin to grasp the peculiar coincidence in these manifold legends related by peoples who are even ignorant of each other's names."
>
> You recognise the same relationship in the folklores of Tibet, Mongolia, China, Turkestan, Kashmir, Persia, Altai, Siberia, the Ural, Caucasia, the Russian steppes, Lithuania, Poland, Hungary, Germany, France; from the highest mountains to the deepest seas. You will hear wonderfully elaborated tales in the Tourfan district. They tell you how a holy tribe was persecuted by a tyrant and how the people, not willing to submit to the cruelty, closed themselves in subterranean mountains. They even ask if you want to see the entrance to the cave through which the saintly folk fled.[7]

Of Agharta he writes:

> In many places of Central Asia, they speak of the Agharti, the subterranean people. **In numerous beautiful legends they outline the same story of how the best people abandoned the treacherous Earth and sought salvation in hidden countries where they acquired new forces and conquered powerful energies**.[8]

In the Altai mountains Roerich met an old man who believed that the Chud, a subterranean people, were real. The old man told of how a powerful tribe flourished in a fertile valley. They were peaceful and industrious. Then came a cruel White Tzar with hordes of cruel warriors. The Chud could not resist them but they also had no desire to be enslaved. The Chud then departed into the Earth. The old man took Roerich to a low stony hill where he showed him what he believed was a passage which had been closed by stones.

Roerich does not seem to have been convinced that indeed this was an entrance into anything subterranean. He described the place as being a tomb

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encircled with great stones which was so typical of the period of great migrations. Roerich relates another incident which suggested the existence of subterranean passages. He wrote:

> I remembered how during our crossing of the Karakorum pass, my sais, the Ladaki, asked me, 'Do you know why there is such a peculiar upland here? Do you know that in the subterranean caves here many treasures are hidden and that in them lives a wonderful tribe which abhors the sins of the Earth?'
>
> And again when we approached Khotan the hoofs of our horses sounded hollow as though we rode above caves or hollows. Our caravan people called our attention to this, saying, 'Do you hear what hollow passages we are crossing? Through these passages, people who are familiar with them can reach far-off countries.'
>
> When we saw entrances of caves, our caravaneers told us, 'Long ago people lived there; now they have gone inside; **they have found a subterranean passage to the subterranean kingdom.** Only rarely do some of them appear again on Earth. At our bazaar such people come with strange, very ancient money, but nobody could even remember a time when such money was in usage here.' I asked them, if we could see such people. And they answered, 'Yes, if your thoughts are similarly high and in contact with these holy people, because sinners are upon Earth and the pure and courageous people pass on to something more beautiful.'
>
> **Great is the belief in the kingdom of the subterranean people. Through all of Asia**, **through the space of all deserts**, **from the Pacific to the Urals**, **you can hear the same wondrous tale of the vanished holy people. And even far beyond the Ural Mountains**, **the echo of the same tale will reach you**.[9]
>
> Sometimes either poisonous or vitalizing gases are spread over the Earth, to protect someone. Sometimes you hear how the sands of the great desert shift, and for a moment disclose treasures of the entrances of subterranean kingdoms. But none would dare touch these treasures. You will hear how, in the rocks, in the most deserted mountain ranges, you

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> can see openings which connect with these subterranean passes, and how beautiful princesses once upon a time occupied these natural castles. . . Sometimes the Holy City is submerged as in the folklore of Netherlands and Switzerland. . . In Siberia, in Russia, in Lithuania and Poland, you find many legends and fairy tales about giants who lived at times in these countries but afterwards, disliking the new customs, disappeared.[10]

Roerich's interpretation of many of these tales was that they did not represent real subterranean tribes but the migrations of ancient peoples across Eurasia.

In Tibet he had a most interesting discussion with a Tibetan Lama in 1928. It is recorded in the first chapter of his book. He refers to "Shambhala, the Resplendent." The Lama speaks of a man named Rigden–jyepo who seems to be none other than the "King of the World." He also refers to him as the Blessed One.

The most important excerpts from it are reproduced below:

> 'Lama, tell me of Shambhala!'
>
> But you Westerners know nothing about Shambhala—you wish to know nothing.
>
> Probably you ask out of curiosity; and you pronounce this sacred word in vain.'

Roerich then spends a long time trying to convince the Lama that indeed people of the West are interested in the concept. He mentions that Grundwedel translated the book *The Way to Shambhala* and that another Lama had written a book called *The Red Path to Shambhala* and that the Mongolians had a song about Shambhala. Roerich then tells the Lama that perhaps he even knows something new about Shambhala which the Lama doesn't know. Roerich tells him that a young Mongolian Lama had recently written a book about Shambhala. Roerich continues:

> The Lama studies us with his piercing glance. Then he says: **'Great Shambhala is far beyond the ocean.** It is the mighty heavenly domain. It has nothing to do with our Earth. How and why do you earthy people

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> take interest in it? **Only in some places**, **in the far north**, **can you discern the resplendent rays of Shambhala.'**

Roerich then counters by saying he heard there was an earthly Shambhala. Roerich says:

> We know the stories of the Buryat Lama, of how he was accompanied through a very narrow secret passage. [Roerich continues by trying to show that he had heard several stories of an earthly Shambhala.]
>
> . . .The Lama becomes silent. With eyes half concealed by the lids, he examines our faces. And in the evening dusk, he commences his tale: 'Verily, the time is coming when the Teaching of the Blessed One will once again come from the North to the South. . . You come from the West, yet you are bringing news of Shambhala. We must take it verily so. Probably the ray from the tower of Rigden-jyepo has reached all countries.'
>
> 'Like a diamond glows the light on the Tower of Shambhala. He is there —Rigden-jyepo, indefatigable, ever vigilant in the cause of mankind. His eyes never close. And in his magic mirror he sees all events of Earth.'
>
> 'And the might of his thought penetrates into far-off lands. Distance does not exist for him; he can instantaneously bring assistance to worthy ones'
>
> '. . . **Uncountable are the inhabitants of Shambhala. Numerous are the splendid new forces and achievements which are being prepared for humanity**. . .'
>
> 'Innumerable are the great things predestined and prepared. Through the Holy Scriptures we know of the Teaching of the Blessed One about the inhabitants of the distant stars. From the same source we have heard of the flying steel bird. . . about iron serpents which devour space with fire and smoke.'[11]
>
> In Tibetan lore there is a very strong suggestion that there are some holy

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people here on the surface world, who work with the people of the Inner Earth and who perform tasks at the behest of this civilization. The Lama's reference to people from the stars and to rockets is also of interest. Note that this chat took place long before the space age and the current interest in extraterrestrials. The Lama continues:

> '**Shambhala knows all. But the secrets of Shambhala are well guarded.'**
>
> 'Lama, how are the secrets of Shambhala guarded? **It is said that many co-workers of Shambhala**, **many messengers**, **are speeding through the world. How can they preserve the secrets entrusted to them?'**
>
> 'The great keepers of mysteries are watching closely all those to whom they have entrusted their work and given high missions. If an unexpected evil confronts them they are helped immediately. . .'
>
> Roerich told the Lama tales of people coming out of subterranean tunnels with strange old coins. The Lama replied:
>
> '**Verily**, **verily**, **the people of Shambhala at times emerge into the World. They meet the earthly co-workers of Shambhala.** For the sake of humanity, they send out precious gifts, remarkable relics. I can tell you many stories of how wonderful gifts were received through the space. **Even Rigden-jyepo himself appears at times in a human body. Suddenly he shows himself in holy places**, **in monasteries**, **and at a time predestined**, **pronounces prophecies.'**
>
> '**By night or at early morning before sunrise**, **the ruler of the world arrives in the temple. He enters. All the lamps at once kindle themselves. Some already recognise the great stranger. In deep reverence the lamas gather. They listen with the greatest attention to the prophecies of the future.'**

The King of the World is clearly a physical being like ourselves. Isn't it strange how Roerich should find a Tibetan Lama making statements very similar to those written by Plato so long ago—which this Lama could not possibly have any knowledge of? Why should the King of the World have an

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interest in monasteries and holy places unless he is somehow linked to the religions of the world just as Plato had said? Where is Shambhala? Roerich asks:

> ‘Lama, how does it happen that Shambhala on Earth is still undiscovered by travelers? On maps you may see so many routes of expeditions. It appears that all heights are already marked and all valleys and rivers explored.’

The Lama replies:

> ‘. . . But as yet. . . people have not found all things—so, let a man try to reach Shambhala without a call! You have heard about the poisonous streams which encircle the uplands. Perhaps you have even seen people dying from these gases when they come near them. Perhaps you have seen how animals and people begin to tremble when they approach certain localities. Many people try to reach Shambhala, uncalled. Some of them have disappeared forever. Only a few of them reach the holy place, and only if their karma is ready.’[12]

The early Western travellers to Tibet seem to have consistently told the same tale. And even now, some Tibetans still believe in the existence of Shamballa. It appears that my Canadian Lama correspondent was wrong in his statements about the King of the World.

The Lama never really tells Roerich where Shamballa may be found. But he does say some interesting things, namely:

1. Shamballa lies across an ocean.
2. That from some places in the Far North, one can see the “resplendent rays of Shambhala.” (Is this a reference to the aurora?)

These statements by a Tibetan Lama seem to dovetail strangely with the old Hollow Earth theories which maintain that the aurora is in some way related to an Inner Sun inside the Earth.

I approached the “Tibetan Buddhism” news group online. Does anyone today still believe in Agharta? Most of the replies I received stated that most Buddhists do not believe Agharta to be a real place. It is seen in a spiritual

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light—akin to Christianity's heaven.

One American however told me to take a look at a web page which referred to a Tibetan Lama by the name of "His Holiness Orgyen Kusum Lingpa." This Lama had visited the USA on a number of occasions in recent years. In a visit to San Jose some time in 1996 or 1997, the Lama had apparently made a reference to Agharta. It transpired that he was one of the few Tibetans who still believed Agharta was a real place. While lecturing in San Jose this Lama stated that Agharta could be reached from India by flying northwards for seven days. I would assume the Lama's references were to the speed at which a bird might fly. If that is so then the average bird flying northwards from India for seven days would easily reach the Arctic.

Roerich's lama had stated that Shamballa lay in the far north, across an ocean. Could this be a reference to the Arctic ocean? Could the Eskimo's "hole-in-the-sea" be the entrance to the Underground Empire?

TUNNEL SYSTEMS

Roerich mentioned the rumors of subterranean tunnel systems which might stretch for hundreds of miles. Some of these might reach all the way deep into a central cavity.

It might be worth saying a few words about the possibility of tunnel systems. This is not as comprehensive as it could be, because the existence of subterranean tribes, while important, is not in my opinion as important as the possible existence of a vast Underground Empire.

It seems to me that some types of naturally carved tunnels and caverns must surely exist beneath the surface of the Earth. For those interested in the matter I would suggest a study of the anomalous behavior of geysers and wells. There are certain types of wells which "breathe" and there have also been reports of both fresh water and salt water fish being found in wells which are far from oceans and lakes.

There is also scientific literature which deals with "seismic detonations"—powerful explosions which are heard in seismically active areas. The suggestion to me is that perhaps cavities are collapsing.

Let me give the Reader an example of a very strange earthquake wherein rushing sounds were heard. This suggests to me the possibility of air being compressed through an underground tunnel system during a violent earthquake.

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The *American Journal of Science* carried a report of various earthquakes in California between 1812 and 1855. The earthquake of September 1812 in Los Angeles county destroyed the Mission San Juan Capistrano. The day was clear and very warm. It was a Sunday and people were assembling for the evening service. Half an hour after the start of the service a very loud and distant rushing noise was heard. It resembled a strong wind, but even as the noise approached there was no accompanying breeze. The sea was smooth and the air was calm. Several people left the building because of this loud noise. It was then that the first and most violent shock struck which caused the entire building to collapse with all the people in it.[13] This incident suggests to me that air was being compressed in a subterranean tunnel.

Here's an account from the *Scientific American* of 1896. An earthquake occurred in Charleston, North Carolina on 31 Aug 1886. T. N. Roberts wrote:

> And yet there was yet another peculiar sound, heard both before and after the main shock, occurring at the moments of minor shock and tremor, **which seems to resemble the rush of a great (subterranean) wind**, **or rather as of the passage of a whirlwind or aerial vortex**, **sweeping through the Earth below. Its resemblance to the peculiar rush of wind was most striking**, **as was also its no less marked subterranean character. All these strange occurrences took place in a period of profound calm—not a leaf moving nor a breath of air stirring. These events were subterraneous**, **not aerial**.[14]

Could there be natural tunnel systems which penetrate deep into the Earth and which connect the inner and outer Earths?

DRAGONS AND DINOSAURS

Dinosaurs ruled the Earth far longer than humans have. Now they are all gone. But a few scientists like Prof. Mackal and Dr. Shuker have wondered if some of them have managed to survive through to the present day. I have always been struck by the similarity between dragons and dinosaurs. Conceptually they are much the same thing. They are depicted as gigantic reptilian beasts. How could the ancients have known of dinosaurs since they were not sophisticated enough to engage in archaeology?

Tales of fire-breathing dragons might be nothing more than ancient anti-dinosaur propaganda inspired by meeting these creatures face to face. We

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would not be as awed as they were by such creatures since they hold no danger for us. A man with a high-powered rifle can kill an elephant with little effort. He could do the same to a dinosaur. But then again, if all you had was a spear or a club perhaps you too would be petrified and would exaggerate their attributes and claim they breathed fire!

As we stand poised on the brink of the 21st century, we find some of our scientists wondering if certain ancient mythology might be true. Cryptozoologists have been wondering about possible ancient references to living dinosaurs. In the book of Job (40:15–24) in the Bible one can find the description of a large creature called the Behemoth. The Behemoth has an enormous tail. Many have wondered if the Biblical Behemoth was a dinosaur.[15]

Much more impressive is the Babylonian dragon, the sacred beast of Marduk. Some scientists have been puzzled by pictures of dragons on the Ishtar Gate of ancient Babylon. The creature in question is a large reptilian beast called the “Sirrush.” In 1887 the German archaeologist Professor Robert Koldewey discovered the Ishtar gate. He spent many years excavating it. Koldewey was fascinated by depictions of the Sirrush. He concluded that this creature closely resembled a dinosaur. In 1913 he announced that he believed the Babylonians had kept such a creature at one or more of their temples. Dr. Shuker tells us that a number of scientists have since agreed with Prof. Koldewey. They have not been able to determine exactly which species of dinosaur is involved, but they do believe that the Sirrush must have been a living creature.[16]

Did dwarves and dragons ever exist? Many is the tale telling of the slaying of dragons. Did the vicious and cruel behavior of humans towards these few remaining creatures drive them back? I wonder if such creatures really existed in the dark depths of our history when our forefathers were savages. Could it be that as the human race increased in numbers that they drove various creatures and humanoids to take refuge in a subterranean world? Have some dinosaurs, especially those at home in the water, managed to survive underground?

Do strange animals come up from subterranean depths into our lakes or on to the surface to feed when they tire of their underground habitat?

CONCLUSION

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I wished to show the Reader that there is a considerable amount of human testimony out there which suggests that someone else inhabits this Earth besides us. We have conditioned ourselves to believe that we are alone in the universe, but we may be in for one heck of a surprise. We might not even be alone on our own planet. A deeper question arises: Is this our planet? We are conditioned to believe that we are the sole owners of this world. Science fiction writers have depicted hardy earthlings valiantly defending this planet against superior alien invaders. But what if the truth is far stranger? Could we be squatters on the outside of a strange planet which is very fruitful and which may harbor life both inside and out?

What if an older civilization exists inside the Earth? Does that make them the real owners of this planet? Have they participated in the development of humanity? Did they assist our religions from before the time of Plato? Did they play a role in the development of Judaism, Christianity, Buddhism, Hinduism and other religions?

Is an advanced civilization living quietly inside our planet and watching us from right beneath our feet? Do they have space craft moving in and out of a “hole-in-the-sea?” Have they learnt to overcome inertia? Do their vehicles accelerate at rates beyond our wildest dreams, and do they flash through this solar system at faster than light speed? I pose the question: If a civilization is advanced enough, could its air and space vehicles remain largely undetected? Why not? If the nations of the Earth can already produce stealth aircraft then imagine what a super civilization might be capable of!

If faster than light travel is possible, then this solar system could be a veritable highway and our instruments would be incapable of detecting such activity. We might think we are alone when in fact there is activity going on all around us. The mind reels at the thought that we could be sharing our planet with a super-civilization and never have discovered it. Or has it already been discovered but we just have not yet been told?

Regardless of where you live, I am sure your leaders have lied to you about many things (e.g. inflation, crime rate, sex scandals, etc). Political leaders lie to us about the smallest of things. Do you disagree? What about electioneering lies and false promises? During elections you get a lot of politicians standing up in front of millions of people lying through their teeth with straight faces! Many politicians have lied about small things. Sometimes small things have caused them discomfort and instead of facing up to these small things they have chosen to try to hide or lie about them. Politicians are

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not known for being profound, deep, or able to face up to great truths. Many of them are highly superficial.

What if we are not the sole title deed holders of the very planet on which we reside? Would they lie about that? I think so. Politicians in democratic countries are very insecure. They are always thinking of their careers and of how they are going to get themselves reelected. They are very sensitive to changes in public opinion and they fear getting thrown out of office. Many of them will lie about the smallest of things so as to protect their own positions. They pretend to be in a strong position even when they are not, and will lie through their teeth if need be. This is especially true in military matters. Now what if these insecure little men have to face a potentially older and stronger civilization inside the Earth? What then? How can they possibly pretend that we are in a position of strength when it would be obvious to all that this is not so? As if that is not unpleasant enough, consider how many of them will feel belittled if they had to admit that there was a greater power than them? These are all uncomfortable facts. They may feel very content at being the Top Dogs, and would not be keen to prostrate themselves in front of another civilization. They may feel it robs them of a certain moral authority which they have over us. They may even fear that some of their subjects will flee to such a civilization. Such fleeing people might inadvertently create tensions with that civilization making the situation even more difficult. As the Reader should appreciate, facing up to a stronger civilization only magnifies our own insecurity. Hiding it does not change the reality, but it does still enable our leaders to maintain an aura of superficial authority over us. For them, this may be good enough.

I think we are generally governed by a lot of little men who are very bureaucratic in their outlook. Few of them have any real courage. All they really care about are poll numbers and their image. Many of them are incapable of leading by example. How many of them would be prepared to take a bullet in the chest on the battlefield? They are not made of the sterner, braver stuff, which characterizes the truly great leaders of the past. They could never face up to the tough situations which others faced. We are not ruled by Winston Churchills or Alexander the Greats or Napoleons or Frederick the Greats. For our leaders, avoiding the issue and passing the buck is the only game in town.

If a North Polar Hole exists, then Arctic nations would surely know about it. They may already have tried to make contact with a civilization

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inside the Earth. Perhaps they found them to be indifferent? Maybe the leaders of another civilization already know that agreements with our leaders are not worth the paper they're written on. Perhaps they ignore us out of choice? Such inter-civilization diplomatic failures would only serve to increase the determination of our leaders to keep this from us until they know more. They might not like the idea of admitting to the public that they are not only powerless against such a civilization but also ignorant of its inner workings and unable to engage in a dialogue with it.

Does the idea of an Inner Earth civilization shock you? Perhaps you cannot believe for one second that such a civilization and its entrance could have remained hidden from us for so long.

The Tibetan lamas stated that the entrance to Agharta lay in the far north across an ocean in the vicinity of the aurora. This corresponds to the Arctic where the Hollow Earth theory dictates there should be a hole. The Eskimos whet our appetite by suggesting that there is a "hole-in-the-sea." Could this hole in the sea be the entrance to Agharta? We have established that there are no gigantic holes here on Earth. But what if a much smaller hole lies hidden in the Arctic? Let us now begin the search for the hidden entrance to Agharta.

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Chapter 15: The Mysterious Arctic

From the very beginning, the Hollow Earth theory has had strong ties to the Arctic. This is where everybody expected to find a gigantic hole which leads through to the center of the Earth. Most writers on the subject have often focused themselves on this one aspect alone. People like Marshall Gardner, William Reed and many others have focused almost exclusively on this aspect.

My friend Jeff, formerly a lecturer at the University of California, who got me seriously interested in this, had done his own study of Arctic expeditions and concluded that none of this implied a Hollow Earth. He assured me there was no credible evidence which indicated any anomalous curvature of the surface of the Earth. Furthermore, he pointed out that two expeditions approaching the same pole from different directions would never meet if the Earth has a gigantic hole centered on the pole. They would end up on different sides of this hole and they would soon realize what was causing this. Jeff had studied such instances where expeditions had approached each other from different parts of Antarctica and where they met at the correct spot without any difficulty. Jeff also told me that he knew someone who had been to McMurdo sound in Antarctica and said there were no rumors of a hole in Antarctica.

I had great respect for Jeff, and still do, and I listened to what he had to say, but from the beginning I was convinced that first one must look at the other aspects of the theory before returning to the “Arctic hole problem.” I felt that one first had to see where other scientific evidence pointed (if there was any), before one could reach any conclusions about the Arctic. Geology, seismology, gravity and the Earth’s magnetism were far more important to me than the Arctic. Anyway, at that stage I had been drawn to the problems of the Outer Core of the Earth which suggested to me that we were dealing with a cavity.

The Polar Hole problem did however worry me. I could easily conclude that the Earth is hollow and has no Polar Holes. I could get away with that. Such an idea is an easier sell, and more people would be willing to consider it. A number of people encouraged me to say exactly that. But I wanted to draw a valid conclusion regardless of where it may lead. So I hoped that one

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day I could return to Arctic studies to see what I could make of this business. Were there Polar Holes or not?

Jeff wasn't the only one who dissuaded me from searching for a polar entrance. In fact it was almost a rule of thumb that the higher a person's intelligence was, the more likely he was not to believe in the Polar Hole idea. I did not of course tell anyone this! But one could see it clearly from whence it came. Maybe this says something about my intelligence—or lack of it!

Dr. Gordeev who had lived in Russia, and worked there, told me that he had lots of contact with Russian scientists. He had never once heard rumors of anything strange in the Arctic. Dr. Gohnert also told me there was not one ounce of cartographic evidence showing any deformity in the ocean floor or any anomalous temperatures or salinity which could be construed as showing the entrance into another world.

In the latter stages of my study I came to suspect the existence of uncharted land in the Arctic Ocean. To test some of my ideas I contacted two world-famous polar explorers.

The one was Sir Ranulph Feinnes, the author, and a former member of the British Special Air Service (SAS). I actually contacted him twice. Once because of Crocker Land and another time because of a strange rumor I heard regarding Antarctica. On both occasions he replied to me saying that there was nothing untoward in either the Arctic or the Antarctic.

The other gentleman was Wally Herbert, who was the leader of one of the most ambitious Arctic adventures of this century. He was rather annoyed by my persistent questioning, and flatly told me over the phone that there is definitely no uncharted land near the North Pole.

I happened upon a scientist from the British Antarctic Survey. It seems I was not alone in searching for Polar Holes. He had heard of this idea, and set out to kill it. Of his own accord he had acidly posted a message on an Internet News group saying that he had worked in Antarctica. He had seen aerial photographs covering all of Antarctica and there were no holes there. This idea, so he said, was utter nonsense.

I also communicated with a retired NASA employee who had been at mission control during the Apollo space program. He replied to me saying that earlier in his career he had flown all over the Arctic in service of the USAF and there were no holes there.

A Norwegian gentleman mockingly told me that this Hollow Earth business was pure rubbish, and that there were no holes in the vicinity of

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Norway. Perhaps he is right in his statement. But just because there may be no holes near Norway doesn't mean there are no holes at all.

The above testimony from intelligent people, would be more than enough to get most people diving for cover. But I'm a skeptical fellow. My career in computers has taught me to distrust all human opinions, reasoning, assurances and conclusions! In many ways, my attitude is not all that far removed from that of pure scientists. But, my bias lies in a different area. Instead of regarding things as impossible, I tend to be open-minded and to regard everything as theoretically possible. So my approach was that of finding bugs in computer programs. Look closely and scrutinize every detail several times over. Listen to everyone, fish around and ask open-ended questions. Remember it all for future reference. But don't believe a word of it! Even if Albert Einstein himself tried to convince me otherwise, I would still politely ask for hard evidence to back up his points.

Everybody says the Arctic is well-travelled. I grew up on a farm. And although one could walk everywhere, the truth is that well worn tracks appear in a short space of time. Animals walked along a certain route to and from the river. Tribes-people walked along certain routes from village to village, from farm to farm, and so forth. The whole countryside was easily accessible, and yet most of the time people only walked along the beaten tracks because they were in logical places for logical reasons. When I wanted to see something different I went "exploring." I would wander far from these paths and into the African bush and across farm boundaries. Then I would stumble upon beautiful places hardly ever seen by anyone in the area just a few miles from home. Using the logic of a farm boy, I therefore challenge the city-slicker view that the Arctic is well travelled. There may be veritable "highways" into and out of the Arctic, but that hardly means anything. Logistics alone dictates that access to the Arctic must be determined by the location of air fields; ports; availability of fuel; the range of aircraft and weather. Caves have been hidden for centuries in well-populated areas. Just look at the discovery of the Dead Sea scrolls. If there is anything unusual in the Arctic and the Antarctic then it must lie some distance from the well-travelled paths.

The Arctic (and Antarctica too), is one and a half times the size of the USA. Do you realize how big an area that is? Then there is the bad weather which exists there—the cloud, the fog, the white-outs. It would take you years to crisscross it in detail with an aircraft. Only Armies, Navies and Air forces can muster the necessary time, money, personnel and equipment for

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such a task. The US Military, the Canadian Military , and the Russian Military, must indeed know every nook and cranny of the Arctic because of the Cold War. In their extensive preparations for fighting World War III across the Arctic only they know what's really up there. The silence may mean there's nothing up there. But it could also mean they just do not want to tell us, on Government orders, since they are controlled by politicians. If there is something there which they do want us to know about, and if that thing is small enough we could easily miss it. If it is not on a map then no one is going to bother looking for it. Look at a map of the Arctic and you will see an enormous expanse of islandless ocean. I think the skeptical case is not as solid as many might think.

Myriads of books have been written about Arctic matters, and about the Hollow Earth. But in matters intellectual it is not quantity that counts. Hollow Earthers like Marshall Gardner had been suspicious of Peary's attainment of the North Pole. This was because he thought a gigantic hole was there. Gardner actually missed the most important point of all. The attainment of the North Pole by Peary was bitterly disputed. The war of words between Dr. Cook and Commander Peary and their supporters has never stopped. It is now 90 years later and many books have been written about the matter. The battle is just not ending. Wally Herbert thought he could settle it in 1989 by castigating both Cook and Peary in his book *The Noose of Laurels*. But this only heated up the fight. The two-way fight turned into a three-way fight. There are those who: (a) regard both Cook and Peary as liars; while (b) others regard only Cook or (c) only Peary as the liar. I will however suggest a fourth option.

Before attending to the Cook/Peary dispute it might be worth settling the matter of the Open Polar sea. Marshall Gardner and others tried to show that an iceless sea lay in the far north of the Arctic. They believed this iceless sea was heated by warm air and water which emanated from a tropical Inner Earth. They also believed that many fish, whales and birds which are found in the Arctic Ocean actually came out of the Inner Earth in huge numbers. Hollow Earthers have continually focused on what they thought was the abnormal warmth of the Arctic and claimed it was related to an Inner Earth with a tropical climate.

THE OPEN POLAR SEA

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The promise of commerce between Europe and Asia led to many European nations seeking a direct passage to the east. This resulted in centuries of exploration. It also resulted in many European nations forging world-wide empires of their own, none being greater than that of Britain.

The Portuguese were the first to prove the old Greek philosophers wrong when they headed ever southwards and discovered that indeed one did not die in the heat of the equatorial torrid zone. The route south of South America to Asia was very treacherous and extremely long. The African route was better but still too long. Other routes were proposed too. Some suggested continuing Christopher Columbus's efforts in reaching the east by sailing westwards but this time via the fabled North–West passage. It was hoped that one could sail around the northern tip of North America and on to Asia. The North–West passage was to ultimately prove to be commercially useless.

There was however one route which is mentioned in history books which has been largely forgotten, and that is the route via the North Pole. There were some people who believed the quickest way to sail to Asia was via the North Pole. It might seem like a silly suggestion today, but many took it seriously. The idea was that temperatures did not always fall as one went further northwards. It was proposed that there was an "Open Polar sea." The thinking was that there was a vast barrier of ice around the polar regions and that once ships had penetrated this ice barrier they would find an iceless sea before them. They could then sail across the top of the world, down the other side and penetrate the ice barrier on the other side and find themselves in the vicinity of China.

In fact, Wally Herbert stated that this was the rationale behind much of the early polar exploration. Until 1818 all attempts at reaching the North Pole were shipborne because of the general belief that once one was through the ice barrier one would find an open ocean ahead. It was during this era that the Royal Navy took a special interest in Arctic exploration.[1]

In 1818 Edward Parry decided to try a slightly different tack. He was not completely convinced of the theory of the Open Polar sea. He thought the best way of reaching the North Pole would be to take sledge boats with him so he could travel over the ice and also be in a position to sail across any Open Polar sea which might lie in his path. In later years the European arctic explorers began to change their methods more and more. They abandoned their Open Polar sea ideas and began to behave more and more like the Eskimos. Peary who later reached the North Pole was to be one of the

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greatest advocates of this approach.

Considering that civilized man has known since ancient times that the Earth was a sphere, it should have been obvious that temperatures would keep on getting colder as one went further north. So how did this idea of the Open Polar sea originate? And why did so many believe in it?

Originally the Greek philosophers had envisaged regions of death (torrid zones) which lay just north of Britain where no life could exist at all because of the terrible cold. This was disputed by Christopher Columbus who claimed to have sailed 100 leagues north of Iceland back in 1476–7. He claimed the ocean was relatively ice free at the time. This account of an ice-free ocean north of Iceland convinced many historians that Columbus was lying.

The polar explorer and scientist Vilhjalmur Stefansson sides with Columbus as does the Norwegian philologist and historian Gustav Storm. Storm referred to historical reports which indicated that the winter of 1476–7 in Iceland was extremely mild and that Columbus's account could be accurate. He also noted that weather reports between 1800–3 showed that there were twenty winters during which no pack ice came down from the polar ice cap to the north of Iceland. Hence Iceland does sometimes have mild winters during which the ocean north of it is ice-free.

Storm writes: "One can well understand that Columbus got the idea that you could sail right to the North Pole."[2] Columbus made definite plans to do this. He began planning for a voyage to the North Pole and deposited it in a monastery in the town of Mejorada in 1498, just before he set out on his third voyage to the New World. In a letter written in 1500 he stated that he still intended setting out on this Arctic voyage. Unfortunately Columbus never managed to achieve this dream.

Again, Columbus made some erroneous calculations. This is understandable because the main tools of accurate navigation were only invented several hundred years later. The chronometer in 1735 and the sextant in 1757. He might have believed that he had reached 80° N during his trip 100 leagues north of Iceland. Gustav Storm in fact presents a strong case to indicate that Columbus often made inaccurate estimates of distances, positions, etc because of the primitive equipment of the time. Storm believed Columbus's statement that he sailed 100 leagues north of Iceland is exaggerated. Columbus seems to have thought he had reached a latitude of 78–80° north. This thinking is reinforced by his son's biography of him. His son stated that his father thought Iceland lay at a latitude of 73° N when in

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fact it lay at 63° N. Columbus also believed a degree was 56 mi long whereas it is really 69 mi.

He overstated the distances sailed on his famous voyage in which he discovered the New World and his estimates of the sizes of various islands were wrong by approximately 25–30%. It is fascinating that even though Columbus was the greatest sailor and navigator of his time, that he could have had so many erroneous beliefs deduced from his own experience. Yet he achieved so much. It does not detract from the greatness of his achievements at a time when Europeans were just barely beginning to venture out into the great open oceans of the world.

Columbus worked on a book wherein he set out to disprove the Greek philosophers' ideas of torrid zones. He had been to regions which were considered uninhabitable. It seems to me that Columbus's rebelliousness towards these torrid zones resulted in the Open Polar seas idea which was to last for centuries. From then onwards it was continuously reaffirmed that the polar regions were indeed warmer than theory predicted. This continued to foster the notion of an iceless sea beyond 80° North. In later centuries many geographers and explorers came to believe in this idea.

There were even religious spin-offs from this kind of thinking. For example, about a century ago, a book was written which claimed that the Garden of Eden could be found at the North Pole.

We now know there is no Open Polar sea beyond 80° N and so this idea is scoffed at. Are temperatures in the Arctic really warmer than theory predicts?

The famous Yugoslavian meteorologist, Milankovitch, calculated the temperature that would exist on the surface of the Earth if the atmosphere were completely at rest and the distribution of land and sea were uniform. The following table shows his results:

Latitude (°N)	0	10	20	30	40	50	60	70	80	90
Theoretical (°F)	91	89	83	72	57	37	12	-11	-26	-31
Observed (°F)	79	80	78	69	57	42	30	14	02	-
Difference (°F)	-12	-09	-05	-03	0	-05	+18	+25	+28	+31

I do not know exactly what temperatures were expected by the scientists

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of yesteryear, but I doubt their calculations were any different. As can be seen, from latitude 70° northwards, there is a very large discrepancy between theoretical and observed temperatures. The North Pole is therefore more than 30° hotter than expected for a stationary, non-rotating Earth.

Meteorologists explain this by saying that warm air from the equator blows to the polar regions where the relatively warm air descends. This is very probably the answer. It is easy to see how people moved more and more away from Greek thinking to the opposite extreme.

Interestingly enough, the idea of warm air from the equator was not always the explanation given. Believe it or not, some tried to account for the warmer poles by way of geometry. It is surprising to find that the North Pole and the Arctic as a whole get more hours of sunshine in the year than the equator. This is confirmed by current knowledge. In Dyson's 1979 book *The Hot Arctic*, he writes:

> Extreme darkness exists only at the North Pole, but even there the Sun shines for 28 weeks of the year, you can read a newspaper out of doors for 32 weeks, and there is twilight for another 8 weeks. Its three-month night shortens as you head south until, at the Arctic circle, the Sun can be seen for at least part of every day. Overall there is more light in the Arctic than in the tropics. The North Pole has 140 hrs more daylight than the Equator, and the Arctic Circle 0230 hrs more.[3]

Among the early "explanations" given as to why the North Pole might harbor an iceless sea was one based on exactly the idea given above—that the polar regions actually receive more sunlight than lower latitudes. We now know that it's not just a case of how much sunlight the polar regions receive, but also the angle at which it strikes. The ice and snow is highly reflective and much of the heat is radiated back into space. The extra hours of sunlight do not therefore account for the higher temperatures in the Arctic. The suggestion by meteorologists that equatorial air is the cause of the greater Arctic warmth is much more sensible.

Vilhjalmur Stefansson who made the last geographic discoveries in the Canadian arctic this century was a strong proponent of the "hot Arctic" idea. He provided much evidence suggesting that the Arctic is not quite as cold as we believe and that at times it can become uncomfortably hot in summer. He points out that many people could not believe the reports of polar explorers in

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1937 who stated that it was raining at the North Pole! Rain at the North Pole? Surely not?

Stefansson also believed the placement of meteorological instruments near rivers and oceans resulted in much colder temperatures being recorded than was actually the case inland. He cited the experiences of Richard Finnie who journeyed deep into the Arctic at the age of 17 in 1924. His book contains a photograph of Finnie standing shirtless, by his dogs and sled because of the heat. Although Finnie was heavily tanned he went on to suffer from sunburn. Finnie also believed, from his extensive personal experience, that the Arctic summer could be unpleasantly warm.[4]

There can be no question that the Open Polar sea idea helped to bolster and support the very few who considered the Hollow Earth theory might be true. As can be seen from Milankovitch's table, the temperatures from latitude 70° N onwards are indeed higher than predicted by theory (for a non-rotating Earth). Explorers often came back with tales of warm winds from the north, which were then interpreted by Hollow Earthers as being wind from inside the Earth. The common belief, fostered perhaps by Halley and others, was that the inner Earth had a tropical climate and therefore one would expect warm winds to blow out of a polar opening.

I have seen nothing which leads me to doubt the current meteorological explanation for the heat in the polar regions. In pondering the issue I am not sure if one could expect warm winds from an inner Earth even if it did have some sort of tropical climate. One just wouldn't know what to expect regarding heat inside a Hollow Earth. So it is a bit much to just assume it has such a climate. But even if it did, wouldn't the air cool down as it travelled along a long tunnel to the surface of the Earth? Wouldn't such a tunnel lie in total darkness, and would that not cool down the air so much more? Isn't it therefore more likely that if there are winds coming out of a Hollow Earth that these winds would be cold rather than warm?

Let us go back to where this line of thinking began, and take a look at some of the history of this idea. It is my opinion that Christopher Columbus helped to foster the line of thinking which led to the concept of the Open Polar sea. An Elizabethan pamphlet from 1595 expresses a view similar to that of Columbus:

> The Worldes Hydrographical Discription, Wherein is Proued not Onely by Aucthoritie of Writers, but also by Late Experience of Trauellers and

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> Reasons of Substantial Probabilitie, that the Worlde in All his Zones, Clymats and Places, is Habitable and Inhabited, and the Seas likewise universally Nauigable without any Naturall Annoyance to Hinder the Same whereby Appeares that from England there is a Short and Speedie Passage into the South Seas, to China, Molucca, Phillipina, and India, by Northern Nauigation, to the Renowne Honour and Benifit of her Maiesties State and Communalty. Published by I. Dauis of Sandrudg by Dartmouth in the Countie of Devon, Gentleman. Anno. 1595. May 27.[5]

As can be seen, the pamphlet suggested that all the world was habitable and all the seas navigable. It also mentioned that the quickest way to the east was via the Arctic. Clearly the rebellion against the Greek torrid zones idea was still in progress almost a century after Columbus started it.

> Our old friend Leonhard Euler wrote the following regarding the North and South Poles here on Earth: ". . . for it is well known that the nearer we approach these two points, the colder and more rugged the face of nature becomes. . ." From this little excerpt it is clear that Euler never thought along the lines of Halley or others who thought that heat emanated from inside a Hollow Earth.

David Brewster, the Editor, then disagrees with Euler in the following footnote:

> I have lately had the occasion to show that the greatest cold is not at the poles **but at two points on each side of the pole nearly coincident with the magnetic poles**. . . **(**See Edinburgh Transactions, vol ix. pg. 201.)[6]

Brewster might be correct. Textbooks state that the sub-Arctic is actually colder than the Arctic. It is said that the continents which surround the Arctic Ocean are at a higher elevation and are subject to greater temperature variations, hence the greatest cold is not at the North Pole.

There is however one strange thing about Brewster's observations back then, and that is how he linked the extreme cold with the two magnetic poles (i.e. geomagnetic pole in Greenland, and magnetic pole in Canada).

In 1827 Parry and his companions ventured far north of Spitzbergen believing that he was on an ice-covered continent. But as he journeyed

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further north he found the ice becoming thinner. Before long they found themselves on the edge of what seemed to be a vast Open Polar sea.[7]

Dr. Elisha Kent Kane was an early American polar explorer. His introduction to Arctic exploration began when he took part in a search for the lost Englishman, Sir John Franklin. The polar bug bit Kane and he decided to arrange his own American polar expedition. Kane was one of the last fervent believers in the Open Polar sea idea. Prior to leaving on his own expedition, Kane made his views on the subject clearly known. He gave a lecture to the Geographical and Statistical Society in New York on 14 Dec 1852. He explained that many of the prominent geographers of the time were convinced of the existence of an Open Polar sea. He specifically named: Sir Charles L. Giesecke, Baron Ferdinand Wrangell, Sir David Brewster, H. W. Dove and the Rev. Dr. William Scoresby. “Sir David Brewster” whom Kane mentioned seems to be the same fellow who edited Euler’s *Letters on Natural Philosophy*. It is he who said the coldest parts of the Arctic are in the vicinity of the magnetic poles.

Kane referred to the Open Polar sea as a “Polyana.” Today polyanas are an established fact. But polyanas do not cover the entire Arctic. Open water does indeed occur in various parts of the Arctic and they are something of a mystery, but the Arctic Ocean is by no means an open sea.

Kane expected the Open Polar Ocean to be 2,000 mi in diameter. This is similar in size to the Polar Hole Halley was expecting. I have wondered if Kane was a closet Hollow Earther, but there is nothing in his writings to suggest this. In Kane’s lecture he explained how he was going to try to penetrate the vast ice barrier which surrounded this iceless sea. He intended sailing northwards in the months of July and August when the ice was still melting. Kane, like many others, was certain the ice barrier only extended up to 80° North.

If he could not penetrate the ice barrier by ship, he intended using sledges upon which he was to place small boats. They would walk as far north as they could go and upon reaching the Open Polar sea, they would attempt to sail upon it in these boats. Kane also thought that perhaps Sir John Franklin and his lost expedition had already entered this iceless sea. If so, he intended following suit.

In spite of his lecture, Kane kept his real intentions from his officers and crew. They would probably have mutinied if they knew! He did not tell them he intended sailing through the ice barrier into an iceless sea.[8] By the time

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they discovered his real intentions it was too late.

Kane's views were further strengthened by the experiences of Commander Inglefield of the Royal Navy. In Sir Edward Inglefield's book: *A Summer Search for Sir John Franklin; with a Peep into the Polar Basin* he wrote of how he sailed up to 78° 35' North with his steamer "Isabel." On pages 66–7 he tells of rounding Cape Alexander and:

> . . .the full glory of being actually in the Polar Sea burst upon my thoughts, **for then I beheld the open sea stretching through seven points of the compass**, **and apparently unencumbered with ice.**[9]

Kane had every intention of following Inglefield's route into this Open Polar sea.

Kane enjoyed a position of trust with the Smithsonian Institute and even with the Secretary of the Navy, the Honorable J. P. Kennedy. But this was not enough for him to obtain financing from the US Congress. The Congress, so it seems, did not care too much about the lost English and so Kane's humanitarian appeals fell on deaf ears. Whether Kane really intended finding Franklin is itself open to question. Perhaps it was just an excuse to try to get Government funding? Kane's ideas of where Franklin had gone were wrong anyway. Franklin had never ventured in search of the Open Polar sea. Even so, Kane managed to get the expedition off the ground with private funding, and he set off on a journey which has become one of the minor classics of Arctic exploration.

He did however receive specific instructions from the Navy Department. In a letter to him dated 9 February 1853, J. P. Kennedy, the Secretary to the Navy had written in part:

> In connection with the special duty assigned to you by the order of this Department bearing date 27 Nov 1852, your attention is invited to objects of scientific enquiry; **particularly to such as relate to the existence of an Open Polar sea**, terrestrial magnetism, general meteorology, and subjects of importance in connection with natural history.[10]

As Kane's expedition was sailing northwards in August 1853, winter began setting in. Kane's subordinate officers suggested that he turn back south so they could spend the winter in a warmer clime where their ship

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would not be frozen in. Kane did the exact opposite. He continued sailing as far north as he could, dodging enormous ice-bergs until his ship was frozen in. His ship's advance was finally stopped near Van Rensselaer harbor at a latitude of 78° 45' by masses of polar ice 60 ft high. They nearly perished from this decision. Kane's bold strategy paid off and his exploration northward was to remain unmatched for decades. Here, in Dr. Kane's words, is what he found:

> **An open sea near the Pole**, **or even an open polar Basin has been a topic of theory for a long time**, and has been shadowed forth to some extent by actual or supposed discoveries. As far back as the days of Barentz, in 1596, without referring to the earlier and more uncertain chronicles, water was seen to the eastward of the northernmost cape of Novaia Zemlia; and, until its limited extent was defined by direct observation, it was assumed to be the sea itself. The Dutch fishermen above and around Spitzbergen pushed their adventurous cruises through the ice into open spaces varying in size and form with the season and the winds; and **Dr. Scoresby**, **a venerated authority**, **alluded to such vacancies in the floe as pointing in argument to a freedom of movement from the north**, **inducing open water in the neighborhood of the Pole. Baron Wrangell**, **when 40 mi from the coast of Arctic Asia**, **saw**, **as he thought**, **a 'vast**, **illimitable ocean**,**' forgetting for the moment how narrow are the limits of human vision on a sphere**. So, still more recently, Captain Penny proclaimed a sea in Wellington Sound, on the very spot where Sir Edward Belcher has since left his frozen ships; and my predecessor Captain Inglefield, from the masthead of his little vessel, announced an 'Open Polar Basin,' but 15 mi off from the ice which arrested our progress the next year.
>
> All these illusory discoveries were no doubt chronicled with perfect integrity; and it may seem to others, as since I have left the field it sometimes does to myself, that my own, though on a larger scale, may one day pass within the same category. **Unlike the others**, **however**, **that which I have ventured to call an open sea has been travelled for many miles along its coast**, **and was viewed from an elevation of five hundred and eighty feet**, **still without limit**, **moved by a heavy swell**, **free of ice**, **and dashing in surf against a rockbound shore.**[11]

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After their ships were frozen in, Kane sent forth parties northwards across the ice. Some of these parties reached a point much further north where they saw open seas bordering on the coastline. As Kane mentioned above, they followed the coastline for many miles and estimated that there were thousands of square miles of open ocean as far as the eye could see. Dr. Kane wondered if his men had indeed finally reached the edge of this great Open Polar sea.

Even Kane was not really sure if he had found the Open Polar sea. Nobody today believes he found it. It is believed that he discovered a polyana which is now known to be a regular occurrence in Smith Sound. Dr. Kane's discovery did however help to fuel the Hollow Earth theory for quite some time afterwards. Marshall Gardner, and others, leaned heavily on this as demonstrating that warm water flowed from the North, from inside the Earth.

In 1871 the *Scientific American* made this announcement which was probably the last dying gasp of the Open Polar sea idea:

> . . .4 November, we announced the welcome news that a region, **free from ice of comparatively moderate temperature**, **has been discovered in the center of the Arctic Circle. This open space**. . . **has long been supposed to exist.**[12]

The Arctic Ocean is not always frozen solid. Even explorers like Peary who travelled when the ice was at its hardest, happened upon very large areas of open water. Prior to his final assault on the North Pole he stated that:

> There is no doubt in my mind that the big lead" (open water) encountered on his previous expedition and also in 1902 **"is essentially a permanent feature of this part of the Arctic Ocean.**

He believed it stretched from the northernmost point of Greenland, Cape Jessup westwards to Crocker Land. This is a considerable distance.[13]

I have found nothing which causes me to think that any of this open water is linked to a Hollow Earth. The Polyanas occur in limited geographical areas, but there is nothing which suggests that we are seeing warm water flowing out of a Hollow Planet on a large scale.

There is another line of thinking which might help to explain the idea of the Open Polar sea. It has been suggested by a number of scientists and thinkers that perhaps the Arctic was warmer in past centuries. There is a lot

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of human testimony which tends to support this idea.

Europeans colonized Iceland in 870 AD. By 930 AD, 50,000 people were living in Iceland. Greenland can be seen from Iceland. In 900 AD, a Norwegian colonist on Iceland first saw Greenland and reported it. Erik the Red was a chieftain from the northwest coast of Iceland. In 982 AD, he killed a man, and was outlawed from the island for a period of three years. He decided to use his time productively to go and explore Greenland. He travelled several hundred miles along the west coast of Greenland and spent three winters there. In a marketing campaign better suited to the 20th century, Erik named the island “Green Land” because he believed it would encourage people to settle there! There may however have been some truth to his marketing campaign because it is said that some areas were indeed green and beautiful. On returning from his exile he was able to interest many people in moving there. They set out with 25 ships which carried not only people and their belongings, but also farm animals. Due to rough weather, some ships turned back and others sank. Fourteen ships carrying 400 people finally made it to Greenland. Greenland became a democracy. It held its first session of parliament in 990 AD.

In 1000 AD, its parliament voted for the country to become Christian. The Catholic Church created a separate bishopric for Greenland in 1124. From then onwards until 1537 there was an unbroken chain of bishops who maintained a Christian presence on the island. Much is known about Greenland during this era from the records of the Catholic church.

The Greenland colony was very successful at first, but later went into decline. Many have argued that the Greenland colony was unable to survive because Greenland was becoming colder. One of these people is O. Pettersson who studied old Norse sailing routes. The Norse sailed up the Greenland coast to a latitude of 66° N. According to documentary evidence he noted that there was very little mention of sea ice in this region up to 1200 AD. Norse accounts of their trips from Greenland to North America also do not mention sea ice.

There seems to be some very convincing evidence that indeed the climate was much milder near Cape Farewell in Greenland where the original settlement took place. The soil in this region is now frozen solid all year round. But in those days it was not frozen. The coffins were penetrated by a thick mass of plant roots which indicates that the soil temperature was above freezing. O. Pettersson concluded that ice did not come down as far south in

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those days as it does now.

If the climate really was milder in those times, it would help to explain Christopher Columbus's original observations and thoughts. It might help to explain why the Open Polar sea had support for so long.

Why would the climate grow colder? One possibility is that the Greenland ice cap was growing slowly. As it grew, the ice cap would have had a greater cooling effect on the Greenland climate.

The various facts presented in this section should help to throw some light on the problem of the Open Polar sea idea, and why it lasted for hundreds of years after Columbus. The Open Polar sea idea helped to fuel various ideas. One of these ideas was that perhaps warm air and water escaped from a Hollow Earth.

I think it is fair to say, based on Milankovitch's table, that the Arctic is indeed warmer than it should be. But whether this is due to a Hollow Earth is another question. I can find no evidence in the Open Polar sea theory which can be used as proper evidence to indicate the existence of a Polar Hole from whence warm air and water escapes. One cannot totally rule out that possibility. Let us suppose that there was excess heat escaping from an Inner Earth by way of a Polar Hole. The wind patterns of the Outer Earth are well studied and air from the tropics definitely reaches the Arctic.

This air must undoubtedly have a tremendous effect on the temperature of the air in the Arctic. It is theoretically possible that additional warm air from inside the planet would have a far lesser effect on the temperature of the Arctic than the tropical air does. Let us look at the possible arguments for and against this:

1. It seems likely that air currents on the Outer Earth may lose more of their heat during their journey than would be true for air currents emanating from a Hollow Earth. One could argue that this is so because the distance from an Inner Earth to the Arctic must be 3,000 mi or less compared to the distance of 6,200 mi from the equator to the North Pole.
2. On the other hand, a tunnel leading into an Inner Earth would have to be largely shrouded in darkness, or very oblique sunlight from a Central Sun. Surely this will cause the air to cool down much faster?
3. Since we have ruled out the possibility of gigantic Polar Holes, it follows that the volume of air moving from the tropics to the Arctic

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must be greater than any amount of air which is blowing out of an Inner Earth via a small Polar Hole.

Point (1) above favors heat emanating from inside the Earth whereas points (2) and (3) favor heat originating from the equator. Point (3) is the most important of all the above.

When all the factors are taken into consideration, I favor the idea that the heat in the polar regions is largely equatorial in origin. Even if an Inner Earth were warm, I cannot see how it could have a great effect on Arctic temperatures. It seems to me that at best, hot air from inside a Hollow Earth would only be a minor contributing factor to Arctic heat.

Let us go back to the original postulate. Hollow Earthers stated that because the temperatures in the Arctic were higher than predicted that therefore the Inner Earth must be quite warm. However, even under the most favorable assumptions, Arctic heat can be accounted for adequately by warm air from the equator, hence the original assumption is no longer valid.

At this stage, I think it would be wise to conclude that there is no overwhelming evidence pointing to whether the Inner Earth is hot or cold. It would be best, at this point, to have no preconceived notions on the matter and to be open to any possibility. The Open Polar sea is of no further use to us in our quest, and we must now seek clues elsewhere.

THE OZONE HOLES

Whenever I mention the idea of Polar Holes to anyone, they immediately wonder if the Ozone holes are related to a Hollow Earth. The subject of the Ozone holes is however extremely complex. It is deeply interwoven with the subject of atmospheric physics.

The problem of the Ozone holes is further complicated by the debate over CFC’s and their effects upon it. Generally, scientists believe that CFC’s have caused the Ozone holes to become ever larger. It therefore follows that Ozone holes are a recent development, or at least are much larger now than in the past. There is some debate over this, and the issue has not yet been completely settled.

The Ozone holes are also not a permanent feature of the atmosphere. They only occur at a certain time of year, for a few weeks at a stretch, and then they disappear again. The Ozone holes may be linked to a deeper

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problem, and that is the production of ozone in the atmosphere. The amount of ozone in the atmosphere varies with latitude, and with season. So even if the ozone holes are relatively recent phenomena, that still does not change the deeper problem which has to do with the production and movement of ozone in the atmosphere.

The term “ozone hole” implies a lack of ozone in the polar atmosphere. This is true, but only for short periods of time, at certain times of the year. Ozone is thought to be produced mainly at the tropics by the action of sunlight. It may therefore surprise the Reader to discover that the most ozone in the Earth’s atmosphere lies in the Polar regions. The standard explanation for this is that hot tropical air is always flowing towards the poles where the ozone is then concentrated. This explanation is probably largely correct. But, I have wondered whether this ozone is supplemented by ozone which is produced by an Inner Sun located inside the Earth?

Take a look at Figure 15.1. It shows that for most of the year, the Polar regions (80° N) have much more ozone than any other part of the Earth. Then suddenly, these levels drop drastically. One would expect these levels to continue dropping throughout winter, especially at mid-winter when there is least sunshine, but this is not so. Does all the ozone in the Earth’s atmosphere really only come from the tropics? Or could some of it originate from inside the Earth?

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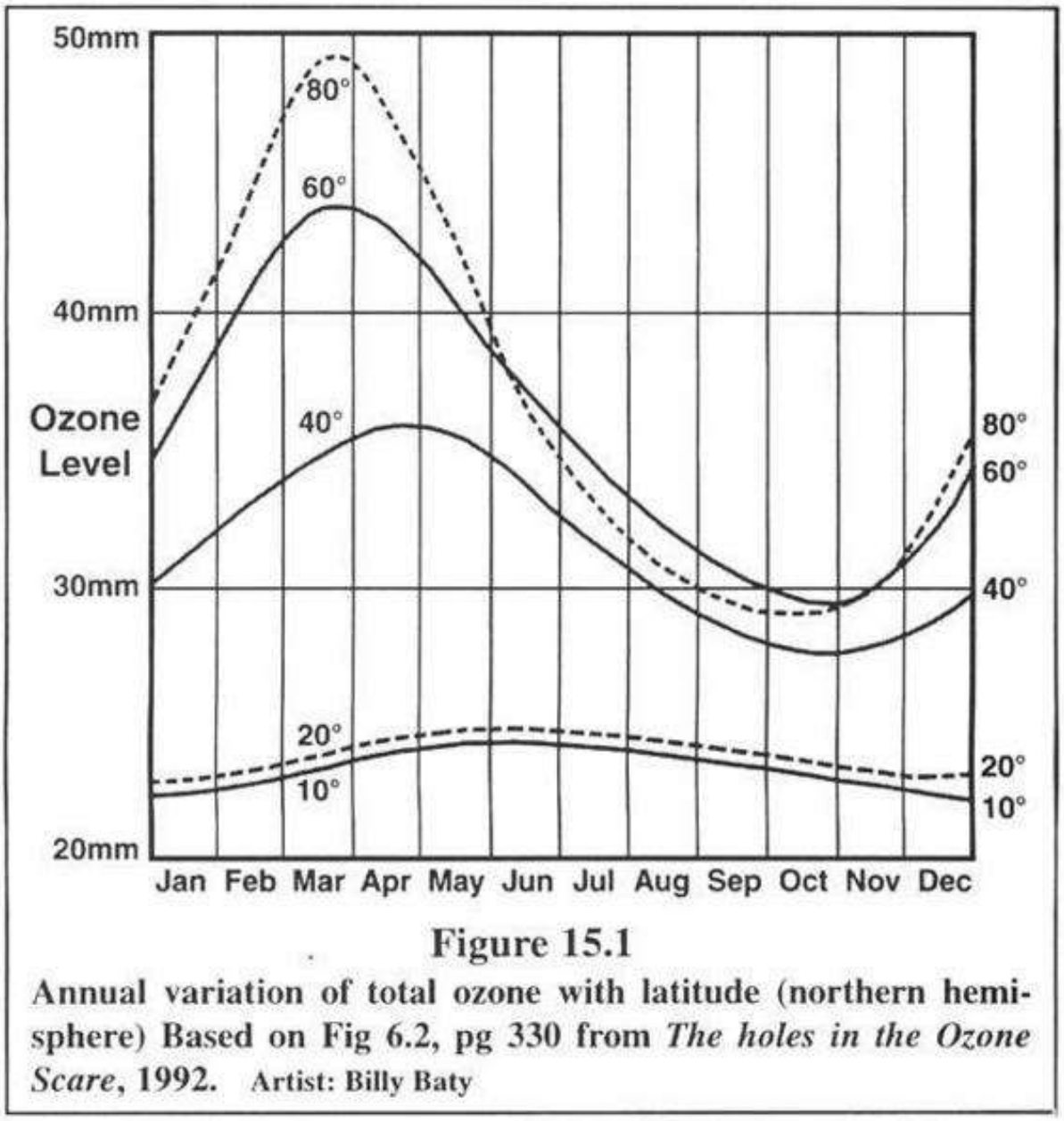

Figure 15.1

Annual variation of total ozone with latitude (northern hemisphere) Based on Fig 6.2, pg 330 from *The holes in the Ozone Scare*, 1992. Artist: Billy Baty

My real interest in the Ozone holes was to see if they could be useful in determining the location of any Polar Holes which may or may not exist. The problem is that the Ozone holes cover an enormous area, and are therefore of no use in pin-pointing something so small. They also move around considerably.

In 1996 it was announced that the Ozone hole over Antarctica was larger than ever. The Ozone hole over Antarctica had widened to a record size, and was nearly as large as the combined areas of the United States and Canada. It covered an area of 6.9 million mi^2 for 50 days. In late September and early

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October, the hole reached a maximum size of 7.7 million mi^2. The largest Ozone hole ever measured this decade was 8.5 million mi^2 in size.

Along with the Ozone holes, I was also interested in the electric currents which flow high in the polar atmosphere. These electric currents move around and have been measured. I wondered if they too had a link with Polar Holes. I found the Ozone holes; the electric currents; and the Auroral Oval to be large scale phenomenon. They are very mobile, and it is extremely difficult to see how they could be used to pinpoint something much smaller like Polar Holes. So I did not take these researches further. However, this does not mean that there's nothing there. It is entirely possible that as science advances, and as more satellite data becomes available, that one could in fact revisit these ideas. For the purposes of this book however, I decided that there was lots of work involved and there seemed to be little to gain from pursuing these ideas at this time.

THE MINI OFFSET-HOLE PROPOSAL

From the earliest days of this study I had been wondering how easily a small hole could be hidden up in the Arctic, especially if its location had no special significance. For example, many people travel to the North Pole, the North Magnetic Pole or to the North Geomagnetic Pole. But what if there is something elsewhere?

Firstly, a small hole is much easier to "hide" and much harder to find. If it is small enough its effects on the weather would be minimal. This would be in line with the conclusions I drew regarding the Open Polar sea. A small hole might exhibit no special characteristics which would make it stand out on satellite images.

What would happen to a polar explorer who is sledding across the ice in the vicinity of such a feature? Will he be subjected to warm or cold winds? He might begin wandering into this hole. I have no idea how large it might be, but to remain undetected it must be quite small. Let's make a thumb suck estimate and say it's 50 mi in diameter. Such a feature is small in the Arctic Ocean which is 1.5 times the size of the USA. Imagine trying to find a feature that size in the USA if you had no idea where it was. Imagine walking or even flying around trying to find such a feature. It would take years of intensive searching.

In Figure 15.2 I have tried to give some idea of an offset Polar Hole (i.e.

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it is not centered upon the North Pole). If an explorer were to wander into it would he necessarily end up going right into it? I do not see why this should be so. We have three routes (R1, R2 and R3). Let us suppose our polar explorer is on his way to the North Pole (R3). He might wander partly into this depression. If the feature is small he will not even detect it. He may sledge into and out of it during the course of a day or two. He would only notice the change in slope if he were still heading downward into the hole at the time that he took a sextant reading. The main thing which would give its existence away would be a sextant determination of latitude.

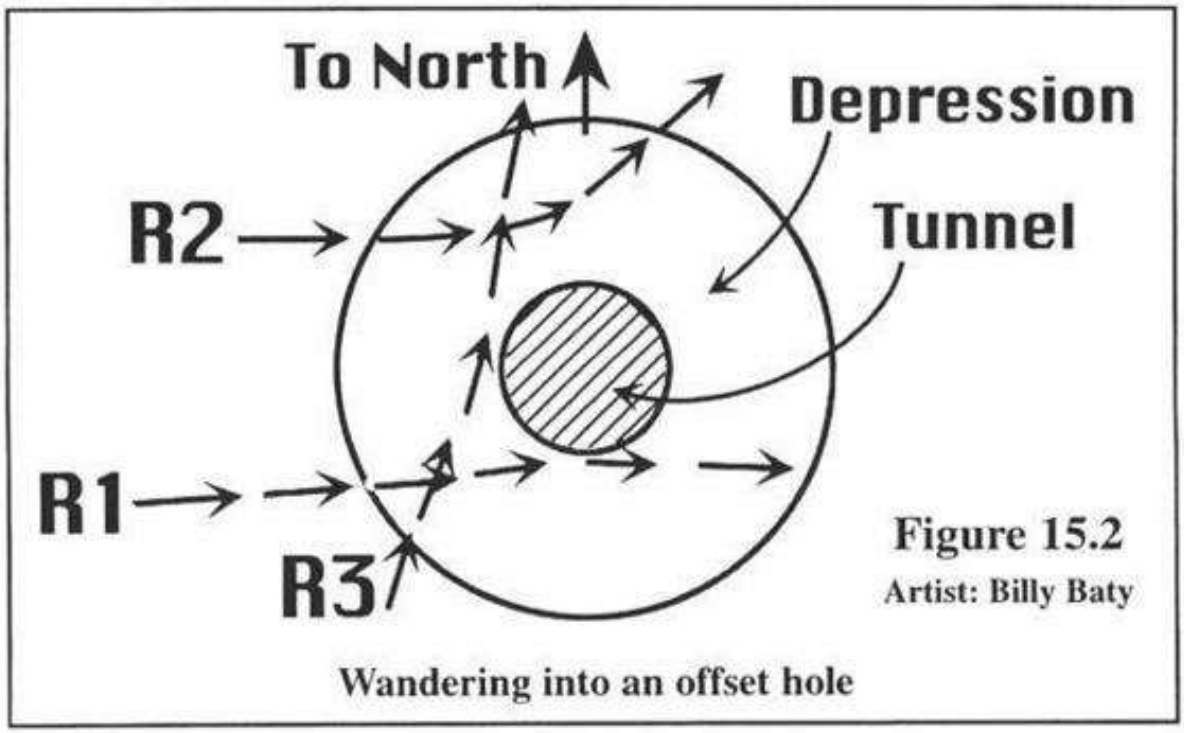

Figure 15.2
Artist: Billy Baty

Wandering into an offset hole

In Figure 15.2 we can see that the actual tunnel itself is an even smaller part of the whole feature. Unless he wanders directly into that tunnel he is in little danger of ever being lost.

A great deal of what happens will depend on the course of the Arctic explorer at the time, and when he takes his readings. He might wander into and out of part of this hole within a single day never even realizing what happened. If he were to take a sextant reading while inside it would depend on where he was inside it at the time as to how anomalous that reading might be.

For example, our northward travelling polar explorer might get a reading

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for his latitude which is either smaller or larger than what he expects. Maybe he will be puzzled and will continue the next day, and then his readings will be normal again. He may wonder what went wrong on that one day and perhaps dismiss the whole thing from his mind. The Arctic is full of uncertainties and many stranger things have happened. Think back to the problem of Nansen and how he was lost for months on end because he could not find Franz Joseph land.

What happens if our polar explorer moves along R1 and crosses the southern boundary of such a hole? If he takes a sextant reading while deep inside the depression he will immediately think he has wandered off course. He will think he is further north than he really is. He may try to correct for it by setting a more southerly course away from the tunnel itself. A similar thing would happen if he was moving along R2. A sextant reading would make him think he is further south than he really is and he may try to correct it by changing his course to move further north. Such events as these might result in a certain amount of "camouflage," which will keep many explorers and travellers out of the hole because they will think they've made some navigational error. No doubt, the next day, or whenever they manage to get out of the hole they might be a little puzzled as to what exactly had happened. These are simple thoughts to keep in mind when pondering this problem.

All the old Polar Hole proposals had a Polar Hole centered on the geographical poles. This implied that anyone travelling to the North or South Pole, would eventually find themselves on the rim of an enormous cavity so large, that one could not even see across it. Since Peary was the first man to make it to the North Pole, I thought that an examination of his sledding speeds would provide the clue as to whether he was indeed travelling up to the rim of a gigantic hole. His horizon would be foreshortened, and his sextant determinations of his latitude would give him the false indication that he was speeding up as the curvature increased. As has been explained earlier, there is nothing anomalous about Peary's sledding speeds. He definitely could not have been travelling up to the rim of a hole.

This caused me to wonder what the effects an offset hole would be. What if a hole were to be located some distance from the North Pole? Would the effects on navigation be as obvious and as simplistic as one would expect for a hole centered on the geographical pole? Such a "slanted" or offset hole would produce strange effects depending on one's direction of travel and the time of year. It would indeed mess up one's navigation. It seemed to me as if

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an offset Polar Hole presented more problems and would be much more difficult to find.

I would also like to raise one more possibility regarding the “natural camouflage” a hole might have. I have argued back and forth as to whether air coming from a Hollow Earth is warmer or colder than the surrounding polar air. I never could reach a conclusion either way. There are simply too many unknowns, and I could find nothing decisive to swing my opinion one way or the other.

There is an important effect which hot air would have which cold air cannot. If, as Hollow Earthers maintained, there is warm(er) air and water emanating from inside a Hollow Earth, and if this air does indeed cause some (but not all) polyanas and the melting of sea ice, then we are left with an interesting possibility. We might be left with a “hole-in-the-sea” just like that old Eskimo legend stated. Such an ice-free hole could be sailed upon. Our Eskimo could indeed paddle into it in his kayak, and he could go fishing in it. But, such a hole would be impassable to the polar explorers who used sledges. Either the entire hole would consist of open water, or the ice would be thinner and more dangerous than is normally the case. In either case, the warmer weather emanating from the hole itself would make it impassable.

If such were the case, then no normal land-based expedition could wander into it. Its anomalous curvature would never be discovered for the simple reason that nobody could enter it accidentally. All expeditions so far have had various geographical targets to reach. When Peary and others were confronted with open water they simply found other routes around it. This particular scenario strikes me as one very sensible reason as to why a mini-hole could remain totally undiscovered, simply because explorers would always be bypassing it. Its true nature would only be discovered by those who brought canoes along with them, or more likely, by those who travelled through the air.

This is one possible reason why a small Polar Hole might remain undiscovered for the most part. It is an interesting line of thinking which is worth keeping in mind as a possibility.

CONCLUSION

Hollow Earthers have long been suspicious of events in the Arctic and the Antarctic. In spite of their scrutiny however, they found virtually nothing

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of substance to indicate that gigantic Polar Holes exist.

Much of this old thinking leads nowhere. Is this how the Hollow Earth theory finally dies? An open-minded person like myself took a good hard look at the facts and concluded that most of what had gone before was incorrect. Many on my Internet list-service agreed with me.

It seemed quite possible to me that a Polar Hole could lie anywhere in the Arctic and it could be quite small. Finding it might be very difficult indeed. The “Mini-Offset-Polar-Hole” idea seemed quite promising —at least in theory. Whether such a feature exists is a whole different question. But from a theoretical point of view the idea has many merits. It also changes the Polar Hole equation. It makes things much more difficult. Yet it alone may be the solution to a myriad of scientific anomalies which I have raised.

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Chapter 16: The Missing Continent

A mini offset-polar-hole has many attractions. So much of what I discovered with regard to the aurora, meteorology and LDE's made me think there really had to be small Polar Holes here on Earth. These holes might be so small that detecting them by seismology alone might be difficult unless one was looking specifically for them.

DESPAIR

I was very frustrated and terribly depressed at the thought that even though I had come this far I still had nothing concrete to offer with regard to the physical location of such a feature. I had vowed to myself from the beginning that if anything physical existed it should be marked on a map. Even if I could not go there to take a look, at least someone else should get the chance. I had been conducting this study for some years, writing this book, and examining the evidence without knowing what my final conclusion would be regarding Polar Holes. Everything had gone so well, except for the Arctic. I couldn't believe it. I had scrutinized everything, photos, science , and the whole lot. I took out atlases, bought the finest maps, and there was just nothing to be seen. Not the faintest clue.

Just look at the polar chapters preceding this one. Everything I have written about the Arctic so far has shown that I came up empty-handed. I just could not find one sound hint of Polar Holes on Earth. I wallowed in the deepest blackness of despair looking at all this, feeling there was circumstantial evidence for holes but no actual holes. Why were these holes so elusive? What was missing?

I had discussed Arctic navigation in detail with LTC Molett. Nothing. No anomalous curvature. I poked through other Arctic literature and examined various incidents which came to mind. But there was nothing.

I only had two areas to look into before winding up my Arctic research. Then I would have to admit that I could find no physical evidence of Polar Holes. Hollow Earthers had often claimed that islands and even mountain ranges had been struck off Arctic maps. This, they claimed, indicated that the explorers had really been lost. These explorers did not really know where they had been, and therefore no one could subsequently find these features.

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The Hollow Earthers tried to demonstrate that all polar navigation was unreliable, but this was of course not true. I studied this aspect closely and could find no evidence to suggest that polar navigation was highly flawed. On the contrary, it was amazingly accurate. In fact, LTC Molett had told me that by using a sextant alone one could navigate with an accuracy of 2 nmi even at the North Pole itself when using a specially devised grid system. My buddy Jeff had been right all along.

I began wondering if these "missing lands" might be related to the elusive anomalous curvature I was looking for. I wondered if these islands and mountains really existed inside Polar Holes. Maybe these places had to be removed from maps because they really did not belong to the outer sphere of the Earth? So I decided to go in search of these "missing lands" to see what, if anything, I could find.

The other issue had to do with the discovery of the North Pole. I had long been aware of the Cook/Peary controversy. Dr. Cook claimed to have reached the North Pole a year before Peary. Heated fights between them and their supporters broke out. Eventually Peary was accorded his place in history as the rightful discoverer of the North Pole, and Dr. Cook was discredited and ignored.

In 1989 Wally Herbert wrote *The Noose of Laurels*. He aimed to discredit Peary. I found it quite amazing that Wally Herbert was essentially doing what Marshall Gardner, the Hollow Earther, had been doing back in 1913. Herbert did the job much more professionally of course. Nevertheless many of Herbert's arguments had a familiar ring to them. Again, it caused me to wonder about the Cook/Peary controversy. I wondered if Herbert could help me to prove Marshall Gardner right? He certainly was an unexpected ally.

Could the Cook/Peary controversy perhaps be related to the Hollow Earth? The only connection I could see were the issues regarding sledding speeds and navigation. Since these resulted in dead-ends, I could not see how there could be any further connection between these two diverse subjects.

Some of Wally Herbert's arguments were similar to those of Gardner, but others were not. Both were hostile to Cook and Peary. They were trying to discredit both of them. But they had different purposes in mind. Gardner had tried to prove that considerable error existed in Arctic navigation. Herbert's methods were also unquestionably superior to Gardner's vague arguments. Even so, Herbert could only find a 1° error in Peary's navigation.

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Nevertheless, he felt this was a mortal sin and set out to destroy Peary's reputation while giving Cook one last kick for good measure—as if Cook had not been kicked enough already. An error of 1° is far too small to be of consequence in Hollow Earth terms. I had hit another dead-end.

Bit by bit, as I followed up the "missing lands" problem, radical new thoughts began falling into place. Wally Herbert had not been keen to talk to me about Peary over the phone. He insisted I buy a copy of his book even though it had been out of print for some time. I was already adept at finding out of print books and obtaining a used copy proved to be easy. While paging through it on the day it arrived, I saw an old map. Immediately, a staggering thought flitted through my mind. This can't possibly be the answer. I lay on my bed thinking about it. Never. This couldn't be—could it? Had I stumbled upon the real answer to the Cook/Peary controversy? The answer was so different to what I had expected. Finally the Cook/Peary controversy began to make sense.

I must thank Wally Herbert. I was on my way to finding half of the answer to the Polar Hole problem, and I would have made it without him or his book. I was concentrating on Peary alone and I was nearly there. But it is Wally Herbert's book that really brought the Cook story home to me. This scientific venture of mine has a touching and human side to it. The truth is an amazing thing. It sometimes refuses to die.

Let us now set off on the final leg of our journey in search of the Earth's elusive Polar Holes. First we will study the problem of "missing lands" and then we will turn our attention to the Cook/Peary controversy.

THE POLAR CONTINENT

Wally Herbert wrote another book called *Across the Top of the World*. In it he describes the exploits of his British Trans-Arctic expedition. He also presents a short synopsis of the history of polar exploration and tells the tale of the tragic De Long expedition.

Take a look at any map in any atlas. It shows the Arctic Ocean to be nothing but an ice-covered sea. The Arctic Ocean is quite shallow, but even so there are no islands in it beyond a certain latitude. There most definitely is no Polar continent in the Arctic. Yet, many explorers and geographers once believed there was something there. Lieutenant De Long was one of them, and he set out to find it.

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Lieutenant George W. De Long commanded the US steamer *Jeannette* in an attempt to reach a presumed continent which lay near the North Pole. De Long believed he could reach this continent by taking advantage of a warm northerly current which flowed through the Bering Straits. He believed this current to be similar to the warm Gulf Stream and that it would open a passage through the pack ice enabling him to sail much further north to this continent. He sailed his ship through the Bering Straits in 1879. Within a week the ship was trapped in pack ice. The ship drifted in a northwesterly direction for seventeen months before sinking near the New Siberian Islands. De Long and eleven others died while twelve managed to survive. What had prompted De Long's madness? Herbert explains:

> He had been strongly influenced by the theory of two young Austrian explorers, Karl Weyprect and Julius Payer, who believed that **the islands of Franz Joseph Land (which they had discovered while attempting to reach the North Pole in 1871–3) were really outliers of a continental land mass—a proposition no stranger than the theory of the Open Polar sea**. . .[1]

In the above Herbert questions the reasoning of Weyprect, Payer and De Long—and attributes it to a misunderstanding of the polar basin. Since Weyprect and Payer were the original discoverers of Franz Joseph Land one can't help wondering what caused them to think there was an entire continent north of Franz Joseph Land? What did they see which caused them to think this?

It is quite amazing that De Long thought he could cross an Open Polar Ocean by sailing from Alaska to this continent! He didn't make it through the pack ice, but again one can't help wondering what evidence must have motivated him to attempt such a daring venture which ultimately cost him his life?

While Herbert chides these gentlemen for their ignorance it is quite easy to see what might have motivated them. Polar bears have been reported far from land. Arctic explorers also reported seeing birds flying north for winter, and of seeing animals going northwards as winter was setting in, instead of going south as is the norm. Such contrary information from Arctic explorers is what led to these ideas. It was inferred that these birds and animals were heading to a warm land in the north. Perhaps evidence such as this made

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Weyprect and Payer think that a continent lay further north.

Take a look at the map in Figure 17.2 in the next chapter. Look at the approximate position of De Long's proposed continent. Look at the sea north of Alaska, but just short of the North Pole. On it are the comments: "This Sea is probably never completely closed." I saw these comments on an old map sent to me by Billy Baty. He came upon this old map in a textbook. Unfortunately, I have no further details available regarding it. But why would a map-maker have put such a commentary there? Or was there certain credible evidence which motivated the map-maker?

The Americans Marshall Gardner and William Reed (author of *The Phantom of the Poles*, 1906), collected a great deal of evidence to show that animals, birds, fish and whales originated from inside a Polar Hole. Many explorers wondered why some birds would fly north as winter was setting in, instead of going south. Hence Gardner and Reed wondered if these animals came from a warmer land further north, inside a Polar Hole. They were not alone in their thinking however. There were geographers and explorers who thought these things could be explained in terms of a Polar continent. To some, the idea of the Open Polar sea tied in with the existence of this continent, and a few thought there might be a relatively warm continent up near the North Pole.

Peary had once thought that volcanic activity of some kind was taking place further north in the Arctic. During his North-Greenland Expedition of 1891–2 he mentioned the following incident:

> [An Eskimo,] Megipsu told me of a heavy fall of black dust or soot during an east wind at Cape York about a year ago which frightened the natives seriously. In this neighborhood the fall was lighter. I could get no further particulars, but as to the general truth of the story I have little doubt. **It seems strongly to indicate the possibility of volcanic dust having reached that region**, **perhaps from some northern area still unexplored**.[2]

There are no volcanoes to be found further north in the Arctic. Nor can continents be found in the Arctic Ocean on any modern map of the Arctic.

Arctic history is filled with many instances where explorers thought they sighted land which turned out to be nothing. In the case of Weyprect and Payer, their lack of experience definitely seems to play a major role in this

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misidentification. Visibility in the polar regions can be very bad. Those unfamiliar with the polar regions will be surprised to discover that mirages are very common in the icy cold weather found there.

One phenomenon which caused much consternation was the “water sky.” Arctic explorers found that they could often determine whether open water lay ahead of them by looking at the sky. The water sky is caused by light being reflected off the clouds, and the clouds acting almost like a mirror in the sky enabling explorers to see, very vaguely, beyond the horizon. I have been told by a ship’s officer from North America that he has often seen this phenomenon in high latitudes. Gardner and Reed thought the “water sky” was due to anomalous Earth curvature in the vicinity of a Polar Hole, but they are wrong.

The “water sky” is, however, merely one of a number of effects to do with the refraction of light in the polar regions. All these things merely served to bedevil the efforts of explorers and it is understandable that some of them made mistakes.

But, what happens when the explorers in question are experienced—perhaps highly experienced? And what if more than one explorer sees the same phenomenon in the same place, independent of anyone else? Then, the whole problem becomes much more difficult to solve.

SANNIKOV LAND

The Russians have often led the way in polar research. I first heard about Sannikov Land from Michael, who is a Russian correspondent on my Internet list. He supplied much of the information below, and also kindly translated some of it from Russian for me.

The Sankt–Peterburg’s Academy of Science organized a research expedition in 1808–10 which was headed by Matvey Hedenstrom. They set off for the Novosibirsky Islands which are situated between the Laptev Sea and the East Siberian Sea. Jakov Sannikov was one of the members of this expedition. In 1811 he claimed that he had seen a vast land to the north or northwest of Kotelny Island which is a part of Novosibirsky Islands. This vast land which he reported was named Sannikov Land in honor of him.

In the years which followed the Sankt–Peterburg’s Academy of Science arranged for other expeditions to go to the Novosibirsky Islands and North of Yakutia. E. Moll took part in these expeditions and he claimed to have seen

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Sannikov Land twice: once in 1886 and again in 1893. Sannikov Land was marked on maps. No one had visited it yet, although it had been seen on the horizon on the three occasions mentioned above.

Nansen, the polar explorer, visited Russia in 1898. On 30 April of that year he had a meeting with Russian scientists in the Hall of the Russian Geographical Society. He discussed the problems of arctic exploration with them for many hours. He also discussed the possibility of finding new islands and lands, among them Sannikov Land. Nansen firmly believed Sannikov Land existed. He hoped to find it when he drifted across the arctic in his ship the "Fram."

Nansen's plan to drift across the Arctic basin in the "Fram" is unquestionably one of the most brilliant, daring, and successful arctic expeditions ever undertaken. Even so, Nansen never did find Sannikov Land. Incidentally, it was on his return home from this expedition that Nansen approached Franz Josef Land. It was during these wanderings that he discovered the errors in Weyprect and Payer's map of Franz Josef Land.

The Russians were absolutely convinced Sannikov Land was real, and they later mounted new expeditions to find it. Michael kindly sent me this translation from the *Big Soviet Encyclopaedia* which states:

> In spite of an intensified search in the first half of the 20th century, the so called Sannikov Land hasn't been found. **In the opinion of some explorers**, **this land has been destroyed by the ocean as has happened to many other islands made mainly of fossil ice.**

So what had Sannikov and Moll then seen? Had they really only seen an ice-island? It had been seen on three occasions in a period of 82 years.

It is hard to believe that the Russians, who are an Arctic people, would be so easily fooled by mirages or strange lighting. To the best of my knowledge, Sannikov Land was seen lying low on the horizon. Maybe they really had made a mistake regarding Sannikov Land. Perhaps some kind of ice-island had indeed been mistaken for land. Sannikov Land has since been removed from maps.

It is very important to distinguish between one-time sightings by inexperienced explorers and genuine mystery lands. Many "islands" have been seen low on the horizon and marked on maps only never to be found again. The vast Franz Josef Land archipelago turned out to be nothing of the

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kind. I am however going to ignore all these “once-off” sightings because they were never independently confirmed in any way whatsoever.

Sannikov Land therefore remains something of a mystery because it was seen on at least three occasions and was marked on maps. Scientists took it seriously enough for extensive searches to be conducted in search of it. Sannikov Land might, or might not be related to a larger mystery. There is, however, one possibility which I would venture to propose. What if the Russian expeditions earlier this century did indeed find something but kept it under wraps? Although this is mere speculation, it is a possibility which cannot be excluded. My thoughts regarding Sannikov Land therefore remain inconclusive.

CROCKER LAND

The most famous “disappearing land” of all is Crocker Land. Crocker Land was originally seen by Peary in 1906. He saw it twice through binoculars and then proceeded to mark it on his maps. In 1914 Captain (later Admiral) MacMillan, Peary’s great friend and admirer, set out to find Crocker Land. History records the fact that MacMillan’s expedition never did find Crocker Land. In fact, MacMillan concluded that Crocker Land was a mirage. Scientists and polar experts these days agree with MacMillan’s assessment, and Crocker Land has long been struck from our maps. If everyone is in agreement then what is the mystery?

The above commonly accepted facts are only a part of the Crocker Land story. Let us first establish what all the facts of the case are before drawing conclusions. In 1906, while William Reed was laboring on his book *Phantom of the Poles*, Commander Peary was busy exploring the far north. Could it be that as Mr. Reed was writing his book, trying to prove the Earth to be hollow, Commander Peary stumbled on land related to the Hollow Earth? It is a tantalizing and exciting thought.

What exactly did Peary see? When? And where? In June 1906 Peary was surveying the northern coastline of Canada. He was mapping the coastline and all the physical features he could find. On 24 June he decided to climb a 2,000 ft mountain which was situated inland, behind Cape Colgate. In his book *Nearest the Pole* he described what he saw as he looked out over the Arctic Ocean:

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> North stretched the well-known ragged surface of the polar pack, and **northwest it was with a thrill that my glasses revealed the faint white summits of a distant land which my Eskimos claimed to have seen as we came along from the last camp**.[3]

A few days later, on 28 June Peary was at Cape Thomas Hubbard at the northern tip of Axel Heiberg Island. Peary was unable to sleep that evening so he hitched his dogs to a sledge and drove it 1,600 ft up a hill. In *Nearest the Pole* he describes what he saw:

> The clear day greatly favored my work in taking a round of angles, and with the glasses I could make out **apparently a little more distinctly**, **the snow-clad summits of the distant land in the northwest**, **above the ice horizon**.[4,5]

I would like to point to an error in MacMillan's book. He states that Peary stood at Cape Columbia when he saw Crocker Land on the second occasion. Cape Columbia is a considerable distance from Cape Colgate and it is inconceivable that Peary could have journeyed hundreds of miles in a mere four days. Perhaps MacMillan got himself confused because Peary mentioned that at Cape Thomas Hubbard they went up a summit where they built a cairn **similar to that at Cape Columbia.** He did this as a means of showing he had been there, so it could be found by later explorers. This mention by Peary of building a cairn similar to that at Cape Columbia might have caused MacMillan to make this mistake. From Peary's records it is clear that the second sighting took placed at Cape Thomas Hubbard. Let us carefully examine the information contained in Peary's original statements:

1. He saw Crocker Land through his field glasses.
2. He stood on high ground at the time of the sightings.
3. Crocker Land stood out above ice horizon.
4. He personally saw Crocker Land twice.
5. The first time he describes seeing "white summits."
6. The second time he describes seeing "snow-clad summits."
7. The sightings were four days apart.
8. Crocker Land was slightly clearer on the second sighting.
9. He saw Crocker Land in the same direction from two different vantage

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points (i.e. Cape Colgate and Cape Thomas Hubbard).

10. Peary also informs us that his Eskimos claimed to have seen the white summits of Crocker land some time on or before the 24th as they came from their last camp.

From the above we can see that Crocker Land was visible for at least four or more days. We have at least three sightings of it from more than one vantage point by more than one witness. All this information strongly suggests that something real was seen.

But how reliable is Peary?

Wally Herbert investigated the Crocker Land problem and dismissed it in two pages. Herbert attacks the problem from different angles. Firstly, he doubts Peary saw anything. He strongly suggests that Peary made up the Crocker Land story. He does however leave himself a back-door open by stating that if Peary saw anything, then it was a mirage. But Herbert's primary choice of explanation however, is that Peary made up the whole story. In his book *Noose of Laurels*, he tries to portray Peary as a pathetic loser trudging up and down an already explored coastline, picking up the "crumbs" left by other explorers, while secretly yearning for more. Here is an example of the type of biting comment Herbert makes:

> But how little had been left on that northern coast for the greatest polar traveler to discover, and how sad it is to see in his diary **those truly pathetic cries of delight as he is reduced to picking up the crumbs that others**, **with much less hunger for fame**, **had left behind on that coast**.[6]

Herbert's main argument against Peary, is that Peary's diaries of the time do not mention the discovery of Crocker Land. Crocker Land is only mentioned in an article Peary wrote in February 1907. Herbert proposes that Peary was in dire straits and that he needed to ensure future financial support for his attempt on the North Pole. Herbert suggests that Peary made up the story of Crocker Land, and that he was stretching the truth regarding his other achievements on this expedition. Herbert points out that this mythical land was named after a George Crocker who was one of the contributors to the Peary Arctic Club. He implies that Peary was looking for money. Herbert writes:

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> Is it not conceivable, then, that however strongly one may wish to ignore it, both Crocker Land and his claim to a new Farthest North may have been forced upon Peary by his desperate need to be given one final chance?[7]

The comments in Herbert's book accurately reflect what he told me over the phone when I phoned him at his home in Scotland. I had wanted to know why Weyprect and Payer had thought there was a Polar continent near the North Pole. So I faxed Wally Herbert several times, asking this question. My faxes mentioned that I was interested in details of "missing lands" which had once been believed to be in the Arctic. He is a busy man, but eventually on 5 February 1998 I managed to unceremoniously get his attention by speaking to him directly on the phone. Having been famous for much of his life he is probably tired of people being a nuisance, and he is probably very tired of the controversy he stirred up through his book. So he was not keen to talk to me. However, as you will by now appreciate, my search for facts is serious, and I was not going to be fobbed off easily. So I pressed him and asked open-ended questions to see what I could draw out of him in the few moments that I had his attention. Our discussion lasted about 20 min.

He told me he had spent four and a half years researching his book the *Noose of Laurels* and that it represented all that he had to say on the subject, and that Crocker Land was dealt with adequately there.

Addressing the issue of a North Polar continent he told me that all explorers had, at one time, believed there was a continent at the North Pole. His words went something like:

> . . . just as people once believed the Earth was flat!"According to him therefore, it was just an unsubstantiated belief. [He then remarked] . . . of course there is no land up there" [as if that was enough to settle the issue.]

What about Crocker Land then? He told me to read *Noose Of Laurels* as it would adequately answer my questions. However I pressed him, whereupon he said that Peary had simply made the story up. Why? Herbert told me that Peary often made outrageous claims when he wanted more money to fund his exploration. He said that Peary simply saw to it that there were no "white men" with him to dispute his testimony. Herbert's arguments

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simply boil down to a total distrust of Peary's character and to dealing with him as if he were a con-man of some kind.

Perhaps I caught Herbert at a bad time, on a bad day, and he just wanted to get rid of this nuisance (uninvited) caller. I was nevertheless very grateful for this chance to speak to him. His book was to prove very useful in bringing home to me the need to follow up on Dr. Cook and the controversies surrounding him.

But let's get back to Herbert's theories regarding Peary. We have seen how many people have tried to slate Peary's sledding speeds for example. In the final analysis Peary seems to have been quite honest. Herbert's overly critical remarks regarding Peary seem to me to be largely unwarranted. Peary was arrogant, and he was obsessed with reaching the North Pole. But, these faults aside, I have not come across any evidence suggesting him to be a con-artist who pretended to discover things which were not there.

Furthermore, pretending to see something which is not there is not a good strategy. For by marking Crocker Land on a map one immediately draws attention to it, and invites others to explore it. It is inevitable that a lie would be found out and that one would suffer a drop in credibility. Was Peary really that rash to attempt such a fraudulent claim? Peary was the greatest arctic explorer of his time. So what if he was pick-ing up crumbs on the northern coastline of Canada? He had many discoveries to his credit and he was still regarded as the favorite to reach the North Pole. I find it hard to believe that Peary would have lost all his financial support just because he did not make any great new discoveries on that coastline.

I wondered what LTC Molett had to say about Crocker Land, since Molett was a Peary supporter. In a letter to me, dated, 1 Sept 1997, LTC Molett made these remarks about Crocker Land:

> About 'Crocker Land', Peary was the first to explore along the northern end of Ellesmere Island. Just before he turned back he thought he saw snow capped mountains far in the distance to the north west. He called this Crocker Land. It was simply a mirage. **White clouds and snow capped mountains can look very much alike in the Arctic. He later admitted it was a mistake but his critics have tried to make him out to be a liar and will give him no credit for an honest mistake**.

LTC Molett was always very courteous and helpful to me so I asked him

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lots of daring questions! At the time I was pondering a number of points raised by Marshall Gardner. Gardner had tried to discredit Peary on another score. He claimed that Peary had travelled across Greenland and had mapped the “East Greenland Sea” in a position which turned out to be dry land. I had studied a number of pilot’s maps obtained from the USA. These maps showed “position errors” of several kilometers on them in this very area. These errors are the result of incomplete surveying. Since I was interested in anomalous curvature I decided to devise something of a “cover story” to try to lure LTC Molett into a discussion about such things. I wanted to elicit more regarding Crocker Land and Greenland. So I made vague proposals that perhaps Peary had been fooled by anomalous Earth curvature and had been lost. I made the elaborate proposal that perhaps he’d walked in a circle and was looking at Canada thinking it was Crocker Land. It wasn’t much of the theory, but I wanted to see LTC Molett’s response to see if it might give me any new clues. He never fell for it and went on to chide me for my “anomaly” theory! Believe me, in this study I tried all sorts of peculiar ruses to try to find out more.

He replied as follows in a letter dated 27 Nov 1997:

> Thanks for your long friendly letter. . . Do you have John Edward Weems’ book *Peary, the Explorer and the Man*? This book gives a good explanation of Crocker Land and the East Greenland Sea. **Crocker Land was simply a very real looking mirage.** As for the East Greenland Sea, on Peary’s first trip to northern Greenland when he reached Cape Roosevelt, as he called it, weather prevented him from seeing the land on the far side of this estuary. All that he could see was water to the north and stretching westward. He thought he must be at the northern tip of Greenland but, of course, he wasn’t. His second trip to this point he realized that he had seen an estuary and not open sea. When your horizon contains nothing but ice, snow and white clouds it is pretty easy to confuse them. . .
>
> **I can put no stock in your geographical anomaly theory. I found navigation in the Arctic as accurate as navigating anywhere else except for the requirement to use different methods to allow for the convergence of the meridians**.

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> Peary took a sounding 5 mi south of his Pole camp on his return journey. At this point he lost some 9,000 feet of steel sounding wire and jettisoned his fathometer. Someday, I feel sure, this wire will be found exactly where Peary said he left it. Peary will then be forever recognized as the discoverer of the Pole and a genuine hero. Regards. . .

Note LTC Molett's reference to Crocker Land being a "very real looking mirage." It is extremely important to remember that Peary wasn't a novice. He had by then been exploring the Arctic for many years. Someone of his caliber should not have been fooled as easily by mirages as others were. The Eskimos seem to have much sharper eyesight than the average Western polar explorer. The mere fact that the Eskimos also thought they saw land is important. Plus, we must not forget that Peary claimed to have seen Crocker Land twice, from two different vantage points days and miles apart. All these things suggest that this is no normal mirage.

I also asked Sir Ranulph Feinnes about Crocker Land and what he thought of the mystery. In an e-mail reply he told me that he had once upon a time researched the Crocker Land problem with "an open mind," to use his words. He assured me there was definitely nothing there.

If Crocker Land is a mirage, then I would tend to side with LTC Molett in saying that I think Peary made an honest mistake. I see no reason to think otherwise. LTC Molett also pointed out that Peary later admitted making a mistake. For once, Herbert and Molett can agree on one thing: Crocker Land is not real. Let me take leave of them and show you why I disagree.

I did not think much of Crocker Land until Dr. Gohnert and I stumbled upon a *Times of London* newspaper article in the basement of one of the libraries at the University of the Witwatersrand. The article was printed on 20 July 1908. It was based on information sent from their New York correspondent on 7 July 1908. It concerned Peary's upcoming attempt at reaching the North Pole and his thoughts on the matter.

Peary was worried that a big lead which he had stumbled upon in previous expeditions was a permanent feature of the Arctic and that it might get in his way. Peary expressed the belief that the lead extended from Cape Morris Jessup (the most northerly part of Greenland), westwards, to Crocker Land. This lead lay at approximately the 84th parallel. He believed his chances of crossing this lead were best if he set out from a point as far westward as possible.

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Peary elaborated upon his strategy to reach the Pole. He then suggested that per-haps the second detachment of his returning party should:

> . . . go west from Cape Columbia along the north coast of Grant Land to Cape Colgate, and perhaps Cape Thomas Hubbard, **and thence to Crocker Land**, **for the exploration of this new section of the unknown Arctic. In regard to this region**, **Commander Peary remarks**, **a well-known Arctic and Antarctic writer has stated that the exploration of Crocker Land might entirely change all preconceived notions in regard to the unknown polar area**.

The article went on to state that Peary was to take sounding equipment with so that he could observe the behavior of tides in the polar sea and determine its relation to "the unknown land masses in the at present unexplored area." Peary made another remark which shows that he definitely believed Crocker Land to be a real land mass:

> Cape Sheridan is practically equidistant from Crocker Land, from the remaining unknown portion of the north-east coast of Greenland, and from his *Nearest the Pole* of 1906.[8]

It was this 1908 article which first brought Crocker Land to my attention and made me realize that Peary thought it was absolutely real. Peary had reckoned distances from Crocker Land, and he even intended sending a party of his own men there on his return journey from the North Pole. I have a polar map from the *Rand McNally Atlas of the World* in 1910 which clearly shows Crocker Land marked on it. Crocker Land was marked on many maps during this time because everyone, including Peary, seemed to be utterly convinced of its existence.

Kindly note Peary's remarks regarding the "unknown polar area." This was the last remaining unexplored region of the Arctic at that time, and Crocker Land lay on the edge of it. In the Rand McNally Atlas it shows the unexplored regions of that time as extending from north of Alaska right up to the North Pole. Crocker Land lies on the eastern edge of this vast unexplored region.

Remember my earlier quote from Peary regarding the mysterious dust which he believed originated from a volcano further up in the Arctic? As the Reader will later discover, there were many people other than Peary who

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each had different reasons for believing that a large landmass existed in the "unknown polar region."

Let us now take a look at Captain MacMillan's 1914 expedition to find Crocker Land. MacMillan describes this expedition in his book *Four Years in the White North*.

MacMillan was awed by Peary. He was his student and had learnt a great deal from him. He was an ardent Peary supporter throughout his life. He referred to his "one short year of Arctic work. . ." "under the tutelage of a great master [Peary]."

MacMillan desperately wanted to go back to the Arctic. There was only one place left to go, the Unexplored region which Peary referred to in his 1908 press release. MacMillan describes it thus:

> I was going back. But where? Far off in the northwest, beyond the heights of Axel Heiberg and Grant Lands, lay the largest unexplored white spot on the surface of the globe, one-half a million mi^2 in area. And at the very edge of this, with its white head beckoning to man, stood Crocker Land, reported and named by Peary in 1906 after one of his supporters. . .[9]

MacMillan tells us he did not go searching for Crocker Land based on Peary's testimony alone:

> My decision to return into the frozen North was not actuated by this single report. Richardson, McClure, Marcus Baker, CPT John Keenan, and Dr. R. A. Harris have all given reasons for the existence of such a land. **This belief has persisted for nearly ninety years. The accumulated evidence of years substantiated Peary's belief.**
>
> My friends realized that this was the last great geographical problem of the North. . .[10]

MacMillan was thus convinced by evidence emanating from many credible sources that indeed a land must exist up in the North. This merely added to Peary's own eye-witness account. Take note of MacMillan's mention that Peary also believed this evidence.

Peary estimated that Crocker Land lay 120 mi from the northern coastline of Axel Heiberg Island. In Figure 16.1 we can see the route taken

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by MacMillan's expedition as they set out from Cape Thomas Hubbard to the northwest across the Arctic Ocean in 1914. He writes:

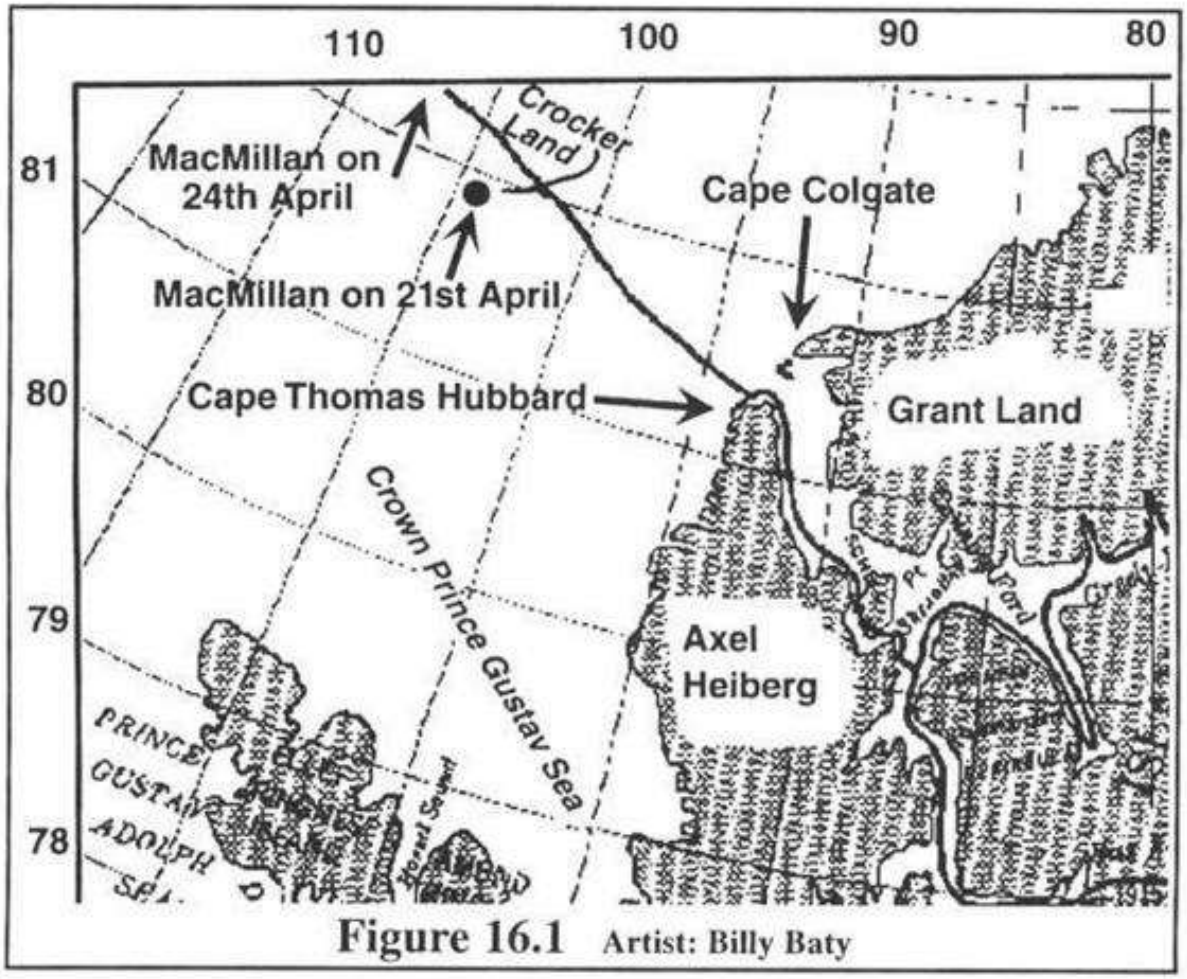

Figure 16.1 Artist: Billy Baty

> We were going into the unknown, toward that point where land had been put down with a question mark, where Doctor Harris said it might exist, where well-known geologists declared that it couldn't exist, and where Peary claimed that it did exist.[11]

It is often stated that MacMillan never found anything as he ventured out on to the Arctic Ocean. However that is not the full story. As they struggled across the pressure ridges they kept a constant watch for Crocker Land. Nothing. Still they continued forth in their northwesterly quest. They had now journeyed 78 mi out onto the Polar sea while bypassing many leads. Looking back, they could barely make out a small dark mass which they thought was either Cape Colgate or some higher point in Grant Land. Then,

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when they were approximately 100 mi from the shore, something very extraordinary happened, the likes of which has never been recorded in the history of exploration:

> **April 21st was a beautiful day; all mist was gone and the clear blue of the sky extended down to the very horizon.** Green was no sooner out of the igloo than he came running back, calling in through the door, 'We have it!' Following Green, we ran to the top of the highest mound. **There could be no doubt about it. Great heavens! What a land! Hills, valleys, snow-capped peaks extending through at least 120° of the horizon. I turned to Pee-a-wah-to anxiously and asked him toward which point we had better lay our course.** After critically examining the supposed landfall for a few minutes, he astounded me by replying that he thought it was poo-jok (mist). E-took-a-shoo offered no encouragement, saying, 'Perhaps it is.' **Green was still convinced that it must be land. At any rate, it was worth watching. As we proceeded the landscape gradually changed its appearance and varied in extent with the swinging around of the Sun; finally at night it disappeared altogether.** As we drank our hot tea and gnawed the pemmican, we did a good deal of thinking. **Could Peary with all his experience have been mistaken? Was this mirage which had deceived us the very thing which had deceived him eight years before? If he did see Crocker Land, then it was considerably more than 120 mi away, for we were now at least 100 mi from shore, with nothing in sight**.
>
> Our prayer now was for clear, cold weather and good going. It was answered. On the morning of the 22d (sic), the thermometer stood at -31° F; the air was clear as crystal. Green got a latitude of 81° 52' and a longitude of 103° 32', which agreed almost exactly with our dead-reckoning. To increase our latitude we set a more northerly course on the 23d and 24th, with a variation of 178° westerly. Observations on these two days put us ahead of our dead-reckoning in latitude 82° 30', longitude 108° 22', 150 mi due northwest from Cape Thomas Hubbard. **We had not only reached the brown spot on the map, but we were 30 mi in-land! You can imagine how earnestly we scanned every foot of that horizon—not a thing in sight, not even our almost constant**

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> **travelling companion**, **the mirage. We were convinced that we were in pursuit of a will-o'-the-wisp**, **ever receding**, **ever changing**, **ever beckoning**.[12]

I would like to draw the reader's attention to MacMillan's navigational notes for the 23rd and 24th. I have wondered whether anomalous curvature due to a nearby Polar Hole could account for them suddenly being ahead of their dead-reckoning. It is an interesting thought worth pondering.

MacMillan's sighting of Crocker Land is stunning. In the above, MacMillan mentions their "almost constant travelling companion, the mirage." Does this imply that they saw Crocker Land on many occasions during this trip? Or is it rather that they saw many other mirages besides Crocker Land? If so, then Crocker Land would seem to fall into a different category, being much more realistic than a normal mirage.

There is another point I'd like to make. LTC Molett's explanation for Crocker Land was that clouds and snow are easy to confuse. He alluded to a horizon which was whitish. In this close-up encounter with Crocker Land, MacMillan tells us that the sky was blue all the way down to the horizon. Crocker Land therefore stood out against this blue background. Thus LTC Molett's theory does not apply in this instance.

The mystery continued to deepen after MacMillan and his men turned back for they continued to see this mysterious, yet unattainable land. They struggled to find their trail through a blinding snow storm. 26 April was a fine day, but MacMillan makes no mention of Crocker Land on that day. They reached igloos 7, 6 and 5 on that day's long march. Then, six days after the sighting quoted above, he wrote:

> On the 27th we marched from igloo No. 5 to No. 4 in the same perfect weather and perfect going, all leads being frozen. **Throughout the day the mirage of sea ice**, **resembling in every particular an immense land**, **continued to mock us. It seemed so near and so easily attainable if we would only turn back**.[13]

MacMillan believed Crocker Land to be a mirage of sea ice. We will study the scientific aspects of his sightings in greater detail later. But first we need to understand the facts he presents. Crocker Land seems to have a peculiar aspect to it. It always seems to be close at hand, yet by now

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MacMillan knows better! They seem to see Crocker Land during extremely clear weather, when conditions are "perfect." This makes Crocker Land difficult to explain as some kind of optical illusion. They see it on the clearest days—seemingly for hours at a stretch. Note his terse description of it as ". . . resembling in every particular an immense land. . ."

MacMillan does not mention the exact date of the last sighting of Crocker Land, but it occurred in May. He decides to go to the nearest land at Cape Thomas Hubbard from igloo No. 3. He found another of Peary's cairns on the summit of Cape Thomas Hubbard. In it he finds and photographs a small note left by Peary with the message: "Peary. June 28, 1906."

MacMillan's final sighting of Crocker Land took place from Cape Thomas Hubbard, and it is every bit as spectacular as the previous sightings:

> We now turned eagerly to an examination of the Polar Sea. Peary stood here in June, 1906, and from this very spot he saw what resembled land lying to the northwest, 120 mi distant. The day was exceptionally clear, not a cloud or trace of mist; **if land could be seen**, **now was our time. Yes**, **there it was! It could even be seen without a glass**, **extending from south-west true (sic) to north-north-east. Our powerful glasses**, **however**, **brought out more clearly the dark background in contrast with the white**, **the whole resembling hills**, **valleys**, **and snow-capped peaks to such a degree that**, **had we not been out on the frozen sea for 150 mi**, **we would have staked our lives upon its reality.** Our judgment then, as now, is that this was a mirage or loom of the sea ice. That there is land west of Axel Heiberg Land—not northwest, as some scientists would have us believe—I have no doubt. I would limit the eastern edge of this land to 120° W longitude, and the northern edge to 82° N latitude, for the following reasons: Our eight days' travel out from Cape Thomas Hubbard was over ice which had not been subjected to great pressure, evidence that it was protected by some great body of land to the west against the tremendous fields of ice driven on by the Arctic current, which has its inception north of Bering Strait and Wrangel Land, across the Pole, and down the eastern shore of Greenland. At our farthest north, 82°, all was suddenly changed. The long, level fields ended in a sharp line going east and west; beyond this line there was the roughest kind of ice, which had evidently been pushed around the northern point of this unknown land over shoal ground extending toward

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the north.[14]

In MacMillan's day the islands to the west of Axel Heiberg island were unknown. It is this "unknown land" which MacMillan is referring to when he mentions its "calming effect" on the ice. A similar situation does not exist near Crocker Land. This could mean that Crocker Land is purely a mirage, or it could also mean Crocker Land is far away.

In the above, MacMillan affirms, for the last time, that Crocker Land resembles real land in every ounce of detail. He speaks of the contrast between light and dark. He mentions, again, "snow-capped peaks"—with its implications for color and contrast.

MacMillan's sighting from Cape Thomas Hubbard is even more amazing than Peary's. Peary only saw the land faintly above the horizon with his field glasses. But MacMillan sees it with the naked eye. Most astounding of all is his description that on this occasion it covers an even wider field of view than happened during his sighting out on the Polar sea. This time it stretches from the south-west through north to north-north-east. It is as if all of MacMillan's sightings of Crocker Land are much "closer" and even more real looking than those of Peary in 1908.

What no writer ever mentions is that the most spectacular sightings of Crocker Land were not by Peary, but by MacMillan and his entire expedition. Let us hark back to Wally Herbert's theory that Peary was a liar who made up all these things. It is not quite so easy to dismiss the testimony of MacMillan, Green and their Eskimos. At this point I think it is fair to consign Herbert's theory to the rubbish heap for there is clearly something else at work here.

It is true they saw a mirage, but it was an incredible mirage the likes of which has never been reported before or since. Mirage? Ghost? No, it's not the same thing. Herein lies a key scientific issue. They never came across anything physical. Does it therefore follow that there is nothing there? Not necessarily. For light is itself a physical thing. Light acts according to laws. Light is produced, reflected and refracted according to known laws. Light does not act like a ghost of some kind. What we have here is excellent testimony that for long periods of time a mystery land becomes visible in the Arctic. But what could cause this? Mirages in the polar regions are distortions of something physical on the ground. This an important fact. Mirages on a hot day result from light in the sky being refracted so that the "water" we see on the ground in fact comes from clouds in the sky. Mirages in the polar

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regions are the opposite. Here we normally see mirages in the sky which are caused by objects which lie on the ground. Polar mirages are therefore a reflection or distortion of something physical. Yes, Crocker Land is a mirage. But a mirage of what? That is the key question here. We are not dealing with magic and witchcraft. We are dealing with science, and Crocker Land remains unexplained in scientific terms, especially when we take into account MacMillan's multiple sightings.

Let us consider what they saw on the 21st. Take a look at Figure 16.1. I have marked, very approximately, their position on the 21st as per MacMillan's statements. They were well-advanced across the Arctic Ocean. They had reached a point far "inland" of where Crocker Land should be. Then, they saw Crocker Land, but it was still ahead of them. In his closing sentences he remarked that it was always retreating, and beckoning. Peary stated that Crocker Land lay in the northwest, and MacMillan also saw Crocker Land in the northwest—or at least that is what is implied. When he saw it again on the 27th he mentioned it was behind them—again implying the northwest. And when they saw it in May it was generally in a northwest direction but across an enormously wide frontage.

Why should the same land be seen continually in only this one direction? This con-sistency suggests that this mirage is indeed related to something physical. Peary and his Eskimos saw it three times in a few days, as did MacMillan eight years later. MacMillan's sea ice theory is still "accepted" by scientists to this day simply because no one has been able to come up with anything better. The sea ice theory is flawed, but no one has been able to better it yet. One has to ask how sea ice can produce an effect so real that it is: (a) the right way up (b) has the right color contrasts (c) has the right shape (d) has the right proportions and dimensions to fool Peary, MacMillan, Green and even some of their Eskimos. Take a closer look at MacMillan's statements. The ice far out to sea was rugged because it was subject to currents and it was constantly on the move. Now if this ice was moving then why was Crocker Land so "permanent" in nature? Crocker Land did not vary in direction. Crocker Land was right there eight years after Peary had seen it. And it lay in exactly the same direction and could be seen from the same spot again. On each occasion its reality was so great that no one doubted it was real—except when they realized they could not reach it. The Eskimos probably noticed a slight wavering of the image. The Crocker Land mirage is amazingly resilient. Peary saw it days apart from different vantage

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points and it seemed absolutely real. On 21 April, MacMillan and his men watched it all day long.

Peary mentions in his first sighting its “white summits.” His next sighting speaks of “snow-clad summits.” MacMillan refers to “snow-capped peaks” on two occasions. He also mentions the light and dark areas and how these match exactly what one would expect of hills and valleys. In these descriptions there are indications of seeing color contrasts. This is implied by the term “snow-capped” peaks. Remember LTC Molett said that the Crocker Land mirage could have been caused by clouds? That idea seems to be in trouble because both Peary and MacMillan seem to suggest that the mountains are dark in color except for the snow lying on their summits. Furthermore, MacMillan expressly mentions that on the one occasion the blue sky extended down to the horizon. From his other descriptions this appears to have also been the case when he was at Cape Thomas Hubbard. All this flies in the face of Molett’s suggestion.

These mirages could not have been some accident of nature since the descriptions of them are highly suggestive of real land, the way it would appear in the Arctic (i.e. snow-clad, or snow-capped). Clouds are even more variable than sea ice, so how could one then explain the resilience of the image over hours and days? And why does it not move around? Why does it always lie in the northwest?

MacMillan describes seeing great detail—down to seeing hills and valleys. Note too, how both MacMillan and Green were absolutely convinced that it was real land. MacMillan was ready to set a course for it. It was only the keen and highly experienced eyesight of the Eskimos which resulted in the verdict that this was a mirage. Even so, the mirage lasted all day long - right until the Sun set that night! MacMillan and his team watched it for the rest of the day. The next day it was gone, even though they continued in its direction. The ice became more difficult and they were running low on sup-plies, so they turned back after having travelled 150 mi out into the Arctic Ocean.

There is one final aspect which makes the description of Crocker Land unlike any-thing ever seen before. Its sheer dimensions are staggering. MacMillan describes it as covering at least 120° of horizon. In his final sighting the frontage seems to be even greater. I know of no mirage with a frontage that wide. It covered a full one-third of a circle, if not more. MacMillan exclaims “What a land!” Yes, what a land indeed. Peary also

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thought Crocker Land was enormous.

What could have created a mirage this spectacular? MacMillan was convinced he was following an ever retreating mirage which had a propensity for disappearing altogether. So he turned back when he ran low on food and when the ice conditions became too difficult. On his return the mirage seemed to follow him! Yet, in 1918, MacMillan still expressed the view that there had been good reason to believe there might be a large land mass up in the Arctic. He made it clear that the impetus for the expedition resulted from testimony other than Peary's. In Appendix VII of his book he records:

Statements concerning the possible existence of land in the Polar sea

[The entry reads:] "Captain Richardson, in his work, *The Polar Regions*; says:" "The Eskimos of Point Barrow have a tradition, reported by Mr. Simpson, surgeon of the Plover (in 1832), **of some of their tribe having been carried to the north on ice broken up in a southerly gale**, **and arriving**, **after many nights at a hilly counter inhabited by people like themselves**, **speaking the Eskimo language**, **and by whom they were well received. After a long stay**, **one spring in which the ice remained without movement they returned without mishap to their own country and reported their adventures. An obscure indication of land to the north was actually perceived from the masthead of the Plover when off Point Barrow**.

In 1850, CPT McClure, when off the northern coast of Alaska, wrote in his journal that, judging from the character of the ice and a 'light shady tint' in the sky, there must be land to the north of him.[The above is a reference to the water sky, except that water makes the sky dark, whereas a light sky would indicate the existence of ice.]

Marcus Taker, writing in the *National Geographic Magazine*, 1894, under the title of *An Undiscovered Island off the Northern Coast of Alaska*, says:

It is often told that natives wintering between Harrison and Camden Bays have seen land to the north in the bright, **clear days of spring. In the winter of 1886–7 Uxharen**, **an enterprising Eskimo of Ootkearie was very anxious for me to get some captain to take him**

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> **the following summer**, **with his family**, **canoe**, **and outfit**, **to the north-east as far as the ship went**, **and then he would try to find this mysterious land of which he had heard so much;** but no one cared to bother with this venturesome Eskimo explorer.
>
> The only report of land having been seen in this vicinity by civilized men was made by CPT John Keenan, of Troy, New York, in the seventies [1870s], at that time in command of the whaling-bark Stamboul, of New Bedford. Captain Keenan said that after taking several whales the weather became—thick, and he stood to the north under easy sail and was busily engaged in trying out and stowing down the oil taken. **When the fog cleared off**, **land was distinctly seen to the north by him and all the men of his crew**, but as he was not on a voyage of discovery, and there were no whales in sight, he was obliged to give the order to keep away to the south in search of them.
>
> In June, 1904, Dr. R. A. Harris, of the United States Coast and Geodetic Survey, published in the *National Geographic Magazine* **his reasons for believing that there must be a large body of undiscovered land or shallow water in the polar regions. He based his theory upon the report that Siberian driftwood had been picked up in South Greenland**, **upon the observations of drifting polar ice**, **upon the drift of the ship Jeannette**, **and upon numerous tidal observations made along the northern coast of Alaska and eastward.**[15]

MacMillan raises new possibilities. He points us further westward to the Alaskan coast. He informs us that Eskimos and sailors have seen land far north of the Alaskan coast on clear days. He tells of the Eskimo who was intent on trying his hand at exploration but he could find no supporters. How sad. MacMillan and everyone else attest to the Eskimos' visual acuity. Stranger still, what do we make of the amazing tale of the Eskimos who actually drifted northward to this land where they found other Eskimos!? Could this really have happened? The general testimony from these different sources suggest that the Eskimos were well aware of this mysterious land. The Eskimos describe this land as being hilly. Both Peary and MacMillan mention the hills and snow-capped peaks of Crocker Land. Could it be that the Eskimos had indeed reached Crocker Land? Then Crocker Land surely

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cannot be merely a mirage, but a real place.

POLAR MIRAGES

The polar regions are well known for their mirages. A mirage is an optical illusion caused by the refraction of light passing through layers of atmosphere of varying density. Objects in the distance may be raised above or depressed below their normal position and may be distorted into irregular shapes.

Mirages are often seen in warm climates (e.g. deserts or sandy plains). The inferior mirage is the most common type seen under these conditions. The air above a hot surface lies in layers of varying density. An inferior mirage causes the distant, nearly level desert surface to assume the appearance of a sheet of water, especially if one observes from a slight elevation or simply from a point above the heated layer. The same effect occurs over a hot road. The “water” is really an image of the sky. One can sometimes observe objects below eye level on this “water” surface. These objects are usually inverted.

Superior mirages are found in cold regions and in conditions where there are strong temperature inversions. They are less common and more spectacular than inferior mirages. Distant objects (often over a sea horizon) are seen upside-down in the sky. There may also be an upright image of the same object above the inverted one. When such a mirage is seen on land, all the trees and other landscape features are inverted, and in all cases of superior mirage, the images are more clearly defined than in an inferior mirage. Superior mirages are not, as is commonly supposed, caused by reflection from a surface above the spectator. The explanation is complicated and involves the action of the wave fronts of light as they progress through strata of varying density. Occasionally, very unusual and grotesque images are observed, especially in the polar regions. Sometimes lateral mirages are also observed, where two layers of air are separated by a vertical plane, but information regarding them is scant.

I contacted Professor W. H. Lehn of the Department of Electrical and Computer Engineering of the University of Manitoba in Canada. He has written a number of papers about polar mirages over the years. Prof. Lehn kindly supplied me with some photos. Take a look at Plate 27. This shows the north coast of Somerset Island in Canada’s Northwest Territories. The

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highest peak in the photograph is 340 m above sea level. Plates 28 and 29 are mirages of the same island photographed from the same spot as the image in Plate 27.

Prof. Lehn described Plate 30:

> This photograph shows a mirage of the coastal mountain range of Somerset Island, located in the Canadian Arctic Archipelago. The mirage portion of the picture is the object that appears to float in the sky above the mountains. The photograph was taken on 4 June 1994, looking south from Resolute Bay, which is at latitude 75° on Cornwallis Island. This island is separated from Somerset Island by the 55 km wide Parry Channel. Such mirages can be expected a number of times each year.
>
> **The mountains themselves are always visible from Resolute on a clear day. This fact alone is somewhat remarkable**, **for the distance to the peaks exceeds 70 km; it illustrates just how clear the arctic air can be.** The floating image is a superior mirage, so named because it appears above the normal image. The mirage contains two images of the region near the mountain peaks: an inverted image beneath an erect image. The anomalous atmospheric refraction that produces the effect is due to a tem-perature inversion above the line of sight. Within the inversion layer the refractive index of air drops fairly sharply, causing light rays to bend downwards. **Thus rays leaving the mountain peak with a slight upward heading are returned by the inversion to a downward heading**, **to enter the observer's eye.** These rays produce an image of the peak that floats above its normal location.
>
> While a good pair of 7 or 8 power binoculars is ideal for viewing mirages, there is no difficulty in seeing them with the naked eye. For example, it is unlikely that any-one looking south from Resolute at the time of the above photo would have missed seeing it.
>
> A summary of technical details: Observer elevation was 67 m above sea level; elevation of the mountain peak was 340 m; the line of sight was 77.7 km long. The photo was made on Kodachrome 200 color slide film, using a 1600 mm lens. The vertical angle subtended by the image, from horizon to the top of the mirage, was 17.4 arcmin. The mountains seen

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> under normal atmospheric conditions would subtend 9.3 arcmin; thus the mirage nearly doubled the image height.
>
> [The mirages in Plates 28 and 29] . . . were photographed at a different time—June 1985. Here the range was a few km shorter (about 70 km), and the camera elevation was much lower (about 3m). Plate 27 was also taken from this site, but in 1987.
>
> The nature of the superior mirage is such that the images alternate in orientation. For example, in Plate 30, we see the normal (mirage-free) image at the bottom of the picture; above it is an inverted image; and above that, an erect image. **Magnification can vary in each one of the images. Sometimes the top erect image is so squashed that you almost can't see it. Based on the mirages I have seen**, **this is the usual case: the topmost erect image is usually quite small (i.e. vertically compressed).**
>
> **On the other hand I have seen mirages where all three images were basically identical in size.**
>
> The image in Plate 28 can be recognized as a five-fold mirage, containing 3 erect and 2 inverted images (Plate 29 is similar). **Images like this are a lot less common.**

Prof. Lehn had sent me the most spectacular mirages he had on file. Clearly, Plates 28 and 29 are exceptional, being five-fold images. Nevertheless, all these images show us what a superior mirage looks like, and how the top-most image is always upright whereas just beneath it is an inverted image. This is best seen in Plate 30. Here we can see how the top-most part of the mirage is an exact reproduction of the mountain range below it. The inverted portion is best seen on the right hand side of the image.

Prof. Lehn also tells us that the polar air is exceptionally clear and that one can see these mirages over considerable distances.

I raised the problem of Crocker Land with Prof. Lehn. He also thought the sea ice theory was the best available explanation for it. So I sent him MacMillan's description of the events of 21 April when he, Green and the Eskimos first saw the Crocker Land mirage. Lehn had not come across this description before and was suitably impressed, describing MacMillan's

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mirage as “very real” but having nothing further to offer regarding the matter. At the time I was not aware of the other instances when MacMillan saw Crocker Land as well, so I did not press Lehn any further.

I asked Lehn if there was such a thing as a “telescopic mirage” which would enable you to see something well beyond the horizon and which can magnify it? In short, can the atmosphere, on rare occasions, behave like a telescope? He replied:

> I have not seen the term ‘telescopic’ mirage in the literature. **Mirages typically magnify objects in the vertical direction. To see and recognize an object over 500 km one would need some lateral magnification as well. There is no particular reason why the atmosphere couldn’t do this**, **but I would imagine the condition would be very rare.** The atmospheric inversion layer would have to form a kind of tube along the line of sight. The observer looks along the inside of the tube. **I know of no observational evidence for such a situation**.

Prof. Lehn referred me to a gentleman by the name of Jerry Kobalenko who was writing a book about Ellesmere Island. Jerry had gone to Cape Colgate and had photographed the mirages he saw there. I was very curious to find out what mirages he had seen from the same spot as MacMillan and Peary had. Had Jerry seen Crocker Land too?

Prof. Lehn also sent me three of Jerry’s photographs because they were good examples of mirages. I was, however, strictly forbidden from reproducing them, because Jerry wants to use them for a book he is writing and also for some *National Geographic* articles he is writing. Jerry was not very keen to talk to me either, because he felt there was a potential conflict of interest between us. The photographs were quite impressive. One of them looked very much like an island perched on top of some very high cliffs. It looked so real that I could not believe it was a mirage, and had to check with Lehn! I could vaguely make out features on the top of this “island.” The other photographs merely looked like tall, dark cliffs. Lehn commented upon this photograph as follows:

> Re: Kobalenko’s photos: . . . [This one] was **the best one**, **looking most like a distant landscape. He told me that he took this picture from**

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> **near sea level off Cape Colgate i.e. from the same place Peary claimed to see Crocker Land. His direction of view was not however Northwest; he took it facing about NNE.** Assuming he gave me the right info, this direction is still out over the open sea ice; again there is no land for many hundreds of km in this direction. The apparent mountains are just an image of irregularities like pressure ridges and shadows on the ice surface. You asked if the cliffs are really just a mirage? Yes.

He continued:

> **The realism of the mirage is quite impressive. One assumes that Peary's and MacMillan's mirages were similar**, **and very stable**, **lasting a long time**.

Regarding the frequent occurrence of mirages in the Arctic, Lehn wrote:

> Good mirages are pretty well the norm in the Arctic. In six field trips covering 1979–94 I have always seen good mirages.

I asked Prof. Lehn if perhaps mirages might be more spectacular in the vicinity of Ellesmere island where the Crocker Land mirage appeared. Lehn replied: "I don't think the mirages are any better at Ellesmere." Since I could not use Jerry's photographs, I asked Lehn if he had any which occurred under similar circumstances. He replied as follows:

> I looked through my photos. **Unfortunately I don't have anything very good of mirages arising pure and simple out of sea ice (the Peary case). I have lots of mirages that arise from landforms**. . . They are all images of the same thing—mountains on Somerset Island, about 70 km away from the camera. Mirages 1 and 2 were observed in 1985, and mirage 3 in 1994. In each case the original landscape is visible, together with a mirage floating above it.

I then contacted Jerry and asked him some questions. I asked him if the mirages originated from any particular direction. In an e-mail dated 8th May 1998 he wrote:

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> There’s no particular direction for mirages; sometimes I only see them backlit, when I’m looking toward the Sun; other times, they are at 90° or so. Probably direction doesn’t matter; just atmospheric conditions; but you’d have to verify that with Dr. Lehn.

I had hoped that Jerry’s photographs would shed some light on the Crocker Land matter, and indeed they do. When examining Jerry’s photographs, and Lehn’s commentary, it becomes obvious that Jerry was not in the same situation as Peary and MacMillan. Jerry’s photographs were taken at sea level, with water directly in front of the camera. Indeed, it seems as if Jerry was in a small boat at the time. The photographs show dark water all the way in front of him up to the point where the mirages are seen. The mirages themselves resemble dark cliffs. The mirages are perfectly flat-topped, just like Table Mountain in Cape Town. The tops are as perfectly flat as if drawn with a ruler. There are no “snow-capped peaks” in Jerry’s photographs. There was only one mirage which truly resembled land, and that was one where the entire frontage con-sisted of these “cliffs.” But in the middle it had a gentle, upward curve, like that of an inverted saucer. Jerry’s photographs do not show hills, or valleys or snow-capped peaks.

Since Jerry’s photographs were taken at sea level, with the camera very close to the water’s surface, it becomes obvious that the mirages are nothing more than mirages of water and sea ice. Indeed, Jerry’s photographs portray exactly what a mirage of sea ice looks like. Think back to Peary and MacMillan who stood, 1,600 ft and 2,000 ft above sea level, on a hill somewhere behind Cape Colgate. It becomes obvious that Jerry was not seeing or photographing the same thing they were describing. Jerry’s photographs represent true sea ice. And the objects in those photographs look like sheer cliffs which are mostly flat-topped. This is definitely not the same description which Peary and MacMillan gave. Jerry’s photographs are taken from such a low elevation that the mirages can’t be very far off either. It is as if he is sitting in a boat because small waves can be seen very close by. Some are so close that they are out of focus. Peary and MacMillan saw something enormous which lay at a considerable distance from the shore. And they saw it from the top of a hill of considerable size. The only time when Crocker Land was seen from sea level was on those days when MacMillan and his men were far out to sea. Whatever Peary and MacMillan saw therefore lay a considerable distance from land.

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I think Jerry Kobalenko's photographs are decisive proof that Crocker Land was not sea ice at all. It is also no wonder that Jerry saw sea ice mirages in all directions either. As long as there was an appropriate temperature inversion he would see "cliffs" of sea and ice. Having looked at Jerry's photographs there is no doubt in my mind that Peary and MacMillan were instead faced with something much larger.

Crocker Land could not be a mirage of sea ice, not even magnified sea ice, because it bears absolutely no resemblance to Jerry's images. In all Jerry's photographs, the dominant portion of them depict enormous cliffs. And, apart from the one photograph I saw, they were all perfectly flat-topped like Table Mountain. Now if Peary and MacMillan had seen a similar mirage then surely they would have spoken of "tall cliffs?" But they did not. They spoke of "snow-capped peaks" and "white summits."

They spoke of hills and valleys, and implied an undulating landscape. But there are no hills and valleys, and no snow-capped summits in Jerry's photographs. Since Jerry never ventured far from land, and since he remained at sea level, it follows that he was never in a position to see anything far from shore. That sea ice creates "flat-topped" mirages is nothing of a surprise. From Jerry's low vantage point he was faced with a level sea and ice horizon identical to what one observes when standing on a beach. I see no valid alternative but to suggest that the Crocker Land mirage was created by an enormous land mass far out over the Arctic ocean. That is the only way in which Peary and MacMillan would have seen an enormous mirage which consisted only of mountains, hills, and valleys.

I asked Prof. Lehn if he had any images of sea ice which resembled land. And, as he reported back, he could not find examples of sea ice mirages which looked like mountains or land in any way whatsoever. That, along with Jerry's photographs, seems to me to be decisive proof that the sea ice theory is totally bereft of any scientific validity as an explanation for Crocker Land. The answer must therefore lie elsewhere.

Was Crocker Land a mirage? Definitely. Firstly, MacMillan's Eskimos declared it to be "mist." Mirages are unstable. The "water" seen on a hot day shimmers. Superior mirages are however more stable and much clearer than inferior mirages. Nevertheless, in spite of its amazing stability, Crocker Land had to be a mirage. They watched it change during the day as the Sun moved. Furthermore, it did not lie 120 mi from shore as Peary had thought. As MacMillan approached it, he found it receding. Also, when he retreated, he

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found the mirage at times behind him appearing near at hand when in fact he knew it could not possibly be. Now if Crocker Land was not a mirage of a land 120 mi away, then what could it be? What if Crocker Land was a mirage of something much further away? Could this be true for Keenan Land and for Sannikov Land too? Could these lands somehow be related? Could these be different views of one single gigantic missing Polar continent?

The science of Optics is not a case of witchcraft! Optics has strict laws which are quite well understood. Light is physical in the sense that we are capable of detecting electromagnetic waves. We may not be able to touch it, but it is there. And if concentrated enough it will burn us. Light has a physical reality. The sightings of Crocker Land, Sannikov Land and Keenan Land are simply too consistent to be ignored. I find it hard to believe that Arctic peoples such as the Eskimos and Russians would be easily fooled. I find it hard to believe that Peary, MacMillan, Green and CPT Keenan were either liars or fools.

Wally Herbert's "liar" theory can be discarded with ease. LTC Molett's "cloud" theory seems to me to be a considerable stretch of the imagination and I think it should be likewise dispensed with. More tenacious is the "sea ice" theory. This is the only theory which has some kind of backing from serious scientists. MacMillan had at least three good sightings of Crocker Land, possibly more. On his first sighting he decided it was sea ice. Even so, he could find nothing in his detailed examinations with field glasses which could give the game away. Even in his last sighting, he stated that if he didn't know better, he would have staked his life on the fact that this was real land. I think we are expecting too much of a sea ice mirage. Firstly, we are expecting it to be "magnified" by some means. It must be magnified horizontally and vertically so that it assumes the correct proportions for it to mimic real land. Then, we have to assume that the combinations of light and shade merge nicely to give us "valleys", "snow-capped peaks", hills, etc. MacMillan asserted in his final sighting that he could see Crocker Land with the naked eye. Then, using field glasses, he examined it carefully in the finest of detail. He could find no flaw which showed this to be anything other than land. Peary's view was not as good, but he was also convinced it was land.

Keenan Land suffered a fate similar to that of Crocker Land. Keenan Land was seen from Harrison and Camden bays by the Eskimos. Then, CPT Keenan saw it out at sea, further north of Alaska. These lands may disappear for a time, but every now and then when excellent atmospheric conditions

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prevail they should reappear. I will bet you that all these mirages can still be seen to this day, if only someone would bother to go and take a look.

There is however, an aspect of the mirage theory which poses a problem. Superior mirages are normally upside-down! Nobody ever said these lands were upside-down. If these explorers had seen upside-down images they would have mentioned it. Instead, they thought time and again this was a real land. Peary thought it was 120 mi away. MacMillan mentioned how close it seemed to be. He was even planning his course across the ice towards it. These mirages were so real-looking in every detail, that no one suspected they were mirages until someone went closer. Remember how Nansen also tried to get to Sannikov Land? He sailed right up to where it should be and like MacMillan, he found nothing. Yet prior to that Russian scientists and geographers were convinced of its reality. Not only that, but Michael quoted the *Big Soviet Encyclopaedia* as saying that earlier this century the Russians launched an extensive land and sea search for it and found nothing.

Superior mirages are, by default, clearer and more real than inferior mirages. But the most common incarnation of a superior mirage results in a distorted upside-down image. Other variations on the theme result in severe vertical distortion. I have seen photographs of hills in Antarctica which were distorted to look like skyscrapers, with perfectly straigh sides. Clearly, this kind of distortion was not apparent in Crocker Land and other mirages. Any such distortion would have made it apparent to the Russians, the Eskimos and the experienced American explorers that they were looking at a mirage and not a real land.

Less often however, superior mirages have another image above them—which is the right way up. Could it be that Crocker Land is an instance where, for some unknown reason, we are only seeing the top image? If so, then why don’t we see the lower inverted image? I have not come across any mention that only the top part of such a mirage can be visible. What could cause this?

Let us delve into the finer detail of optical science. Prof. Lehn, whom I mentioned earlier, had developed a very sophisticated mirage simulation program. Lehn’s computer program traces each individual light ray as it would move from the object (e.g. a hill), through the various layers of air, to the observer’s eye. It takes into account the varying ray paths and the various complex refractions which would then take place. Lehn’s program can take the photograph of an object, along with a temperature profile, and then

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calculate and produce an image of the resultant mirage. It can also work back-wards. He can feed in a photo of the object and its mirage, and calculate what the temperature profile was which caused this image. Lehn's mirage simulator is therefore very complex and detailed in what it can do. He later used it for another paper in which he studied the effects of gravity waves on mirages, since mirages are inherently unstable. In his 1992 paper in *Applied Optics* he summarized his mirage simulator as follows:

> A mirage is seen when atmospheric refraction distorts or displaces an image. We describe a mirage simulator that uses digital imaging equipment to generate mirage images from normal photographs. The simulation program relocates horizontal image lines into positions that they appear to occupy, according to rays traced from observer to object. Image-brightness adjustments are not required; **we show that**, **while the atmosphere can change the size or shape of an object**, **it does not change its apparent brightness.** The realistic quality of the computed images makes this simulator a useful tool in mirage analysis.

Lehn's conclusion regarding image brightness is very interesting and important. Images on a computer screen are built using tiny dots, referred to as pixels. His computer program builds a picture of a mirage pixel by pixel. In his paper he states it as follows:

> Adjustment of pixel brightness is not required in the creation of the mirage image; we show in Appendix A **that apparent brightness does not change when atmosphere distorts a normal image into a mirage. This result is consistent with our photo-graphic observations; clearly defined mirage images have shown no anomalous brightness distributions**.

In Appendix A, Prof. Lehn explains:

> **We show that in the spherically symmetric atmosphere the brightness distribution in a mirage image is the same as that of the normal image.** First we obtain a relation between the angle subtended by a unit area looking backward and that looking forward along the same ray; then **we use this result to compare the irradiance of a mirage image with that of its undistorted counterpart**.[16]

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Prof. Lehn follows this with several pages of diagrams and mathematical equations explaining this.

Neither Peary, nor MacMillan, knew of the finer mathematical aspects of mirages. What we have are their "raw," unadulterated observations. MacMillan attests to the incredible size of this mirage as stretching through 120° or perhaps much more. Lehn's conclusions regarding brightness are very important here. It suggests to me that what-ever created the mirage must itself be very large. It does not matter how the light rays were distorted by the atmosphere. The brightness of the final mirage must match the brightness of the original object. This makes the sea ice theory a hard sell. MacMillan told us that Crocker Land matched, in every detail of brightness or darkness, what one would expect of a snow-covered land. Sea ice cannot stand as tall as mountains. If the sea ice were to be magnified to look like mountains then the sea ice would have to suffer a considerable degradation in brightness. Let us suppose some sea ice 20 ft high were to be magnified to look like a hill 2,000 ft tall. That sea ice would have to be magnified both vertically and horizontally. If the sea ice were magnified to have proportions 100 times its original size, then its surface area would increase by 100 x 100 times i.e. 10,000 times. Consequently, its loss in brightness would be in the same proportion (i.e. it would now have a brightness of 1/10,000th of its original brightness per unit area). Anyone who has used an astronomical telescope knows of this effect. If you change the eye-pieces on a telescope then the image becomes dimmer when you use greater magnification. Now if the sea ice were distorted so much and were to lose 99.99% of its brightness, due to it being magnified over such a large area, how would one then be able to see it? And yet we know, from MacMillan's account that he travelled 150 mi out into the Polar sea. Now what does this mean? Does it mean that the original mirage consisted of sea ice very close to him? Or is it that he saw the same mirage all along, and that even after 150 mi it was still the same thing? Since he does not mention seeing the layout of Crocker Land changing, I would suspect that it remained static. He was after all scrutinizing it carefully with his field glasses to see if it was indeed land.

MacMillan had wondered how Peary could see Crocker Land from so far away. He wrote:

> If Admiral Peary did see land due northwest from Cape Thomas Hubbard, then we had moved it at least 200 mi from shore. **To see land**

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> **at a distance of 200 mi from where Peary stood**, **the land must reach an altitude of 30**,**000 ft!** Such an altitude in that latitude and longitude is contrary to all scientific reasoning. The highest peaks of Grant Land and Ellesmere Land do not exceed 6,000 ft, while Axel Heiberg, Amund Ringnes, and Ellef Ringnes Islands are even considerably lower.[17]

MacMillan is therefore convinced that this land could not really have been that high. Mount Everest, the highest mountain in the world is only 28,000 ft high. MacMillan was certain that if Crocker Land exists, then it must lie at least 200 mi from the shore—and probably more.

How could sea ice provide an ongoing mirage which would survive close-up scrutiny from MacMillan who had travelled 150 mi towards it? The sea ice theory might have some possibilities if one assumed that MacMillan, like Peary did not approach it. But how could it possibly be workable when we know that MacMillan travelled 150 mi towards it? Add to that the problems which I mentioned with regard to Jerry's photographs, and the entire edifice of the sea ice theory becomes untenable.

As one takes into account the problems with the sea ice theory, it then becomes clear that Crocker Land must indeed be very large, and also very far away. One must take into account another factor regarding brightness. The mirage was only seen on the clearest of days. A clear day enables light to travel a considerable distance through the atmosphere. The polar atmosphere is known for its considerable clarity when fog and cloud are absent. So it is indeed possible for light to travel considerable distances in the Arctic. This would not normally be the case in lower latitudes where dust and moisture impede the propagation of light. Furthermore, we have the icy cold, which is conducive to bending light rays to follow the Earth's curvature. All this increases the probability of land being seen over great distances in the Arctic, when good weather allows. But remember, both MacMillan and Peary stood at elevations of 1,600 and 2,000 ft when they saw Crocker Land from the shore. This would increase the distance they could see. Crocker Land is very probably not visible from the Canadian shore when one is at sea level.

No matter how clear the Arctic atmosphere is, there is, unquestionably, an absorption of light. Light is absorbed by the atmosphere through which it travels. Even the clearest and cleanest atmosphere will absorb light. This places an upper limit on the various explanations we can consider for explaining the Crocker Land mirage.

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1. If a small object, such as sea ice, or an ice-island, is responsible for Crocker Land, then we have brightness problems. A small object, reflecting a small amount of light over vast distances will not be bright enough to be seen. It seems to me, that whatever caused the Crocker Land mirage had to be at least 200 or more miles away. But it is impossible for a small object to produce such a large, bright, and prominent mirage from so far. Remember, when MacMillan returned and stood at Cape Thomas Hubbard he saw it stretching across much more than 120° of frontage. It was splendid and massive in its vertical and lateral dimensions. It seems quite impossible to me that sea ice alone, even magnified, could produce a mirage so splendid that it could be seen with the naked eye from 200+ mi away.
2. I had wondered if Crocker Land could perhaps be caused by mountains some-where in Russia where the light was bent by refraction across the Arctic. Prof. Lehn ruled out such a possibility by saying that light just would not be capable of propagating through the atmosphere over such a great distance. The atmospheric absorption of light prevents this from being a workable alternative.

The limitations mentioned in (1) and (2) now force us to consider an interesting possibility. Apart from the brightness problems, would sea ice be capable of producing, for days on end, a mirage so perfect that both close-up and long-distance inspection with the naked eye and field glasses reveals no logical flaw in it? Furthermore, **why is this land not upside-down?** The only reasonable explanation for Crocker Land, must be the one which at first seems impossible. Crocker Land can only be caused by mountains and real land, somewhere nearby in the Arctic Ocean. It must lie 200 or 300 mi from where Peary and MacMillan saw it. But it can’t be too far away or else the light would not be able to travel that distance through the atmosphere.

Could Crocker Land be somehow related to Keenan Land and Sannikov Land? If one can see land across such amazing distances in the Arctic, could these three lands indeed be one and the same? Note too, that MacMillan described how close Crocker Land appeared to be. But having tried to follow it, he soon discovered that it was not near at all.

Can people see mirages of real objects over a considerable distance?

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Billy Baty who helped with this book, told me the following story about a mirage of the city of Corpus Christi:

> People in the Rio Grande valley not too far from where I live, have seen a mirage of a city on many occasions. It was discovered the mirage city was Corpus Christi which is 100 or so miles away.
>
> I actually knew a man who saw the mirage city on at least two occasions. Apparently the mirage would last for hours and when it would disappear you could drive a small distance and see it again. Sometimes it would appear on the following day.

Billy's description of the Corpus Christi mirage sounds similar in principle to MacMillan's experiences. At times the mirage would disappear altogether. But it could be seen whenever the light rays were refracted to the position where the observer was. Thus, if the mirage disappears, it might simply be the atmospheric layers which have changed and caused the light to be refracted to a different spot. If you go to that spot you can then see the mirage again. One could consciously apply these principles in attempting to trace this mirage back to its source.

I communicated with Matty McNair who led the first women's expedition to the North Pole last year by retracing Peary's route. In an e-mail dated 1 June 1998 she told me about an interesting mirage:

> . . . Ken MacRurry here in Iqaluit. . . told me of seeing land down Frobisher Bay that, with a map, he could identify as the Silvia Grinnell glacier. **This land is too far around the curve of the Earth to see from here**.

There are a number of instances where objects have been seen which are below the horizon. In January 1597 Willem Barents and his crew saw the Sun appearing two weeks early at the end of winter. At the time the Sun was actually 5° below the horizon.[18]

The residents of Marseilles, France have sometimes observed Mt. Canigou in the west, silhouetted against the setting Sun. If a straight line were drawn from Marseilles to the peak of Mt. Canigou it would pass 400 ft below the surface of the Mediterranean. Mt. Canigou is situated 157 mi from Marseilles, and light from it is bent, under certain weather conditions, around

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the Earth's surface. This normally happens in February and October.[19]

From the examples given above, it seems quite feasible for light from objects to be refracted around the Earth when atmospheric conditions allow. What of the apparent magnification of Crocker Land? There are a number of instances where objects have been seen at a considerable distance as if they were magnified by some kind of "atmospheric lens."

For example, on 9 May 1937, several islands in the South Pacific were seen as if they were considerably magnified. Prior to the sighting there had been very heavy rain for a period of four hours. After the rain storm, the sky cleared from the east to the north. Atmospheric conditions were described as being unusually sharp and clear. Tahiti was then clearly recognizable even though it was 210 mi away. It appeared as though it was only 35 mi away. This magnified mirage of Tahiti and three other islands was seen for a period of fifteen minutes before disappearing.[20] It seems to me that the heavy rain storm played a role in clearing the atmosphere of dust prior to the mirage being seen.

Many elements mentioned in the above are similar to what MacMillan mentioned with regard to Crocker Land. A number of interesting mirages seem to occur across water. Take the following instances of the unusual magnification of ships.

On 29 June 1981, the crew of a ship sailing in the South Atlantic observed the unusual magnification of another ship which passed by them. When the ship was 12 nmi away its visual image became four times its normal size for that distance. At a distance of 16 nmi the image became eight times its expected size. It was only when the ship was 20 nmi away that its image size returned to normal.[21]

Many years ago, an even more spectacular sighting occurred off the South African coast. Passengers on a ship near Port Danger observed a very famous English man-of-war in great detail. They later learned that the ship had in fact been 300 mi away from where they had seen it.[22]

The idea of seeing an object 300 mi away may seem unbelievable. There is however, one mirage sighting I came across which seems to have virtually all the same conditions as those pertaining to MacMillan's sighting of Crocker Land. It took place near the Arctic in 1939 and was reported in *Science*.

CPT Robert Bartlett was in command of the schooner Effie M. Morrissey. He had experience sailing in polar waters for forty years, when he

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saw the clearest mirage of his life. At 1600 on 17 July 1939, his ship was between Cape Farewell on the southern tip of Greenland, and Iceland. The Sun was lying in the south-west when the Captain and crew saw:

> . . . the Snaefells Jokull (4,715 ft) and other landmarks [of Iceland]. . . **were seen as though at a distance of 25 or 30 nmi (instead of the actual 335 to 350 statute miles). 'If I hadn't been sure of my position and had been bound for Rejkjavik [CPT Bartlett said], I would have expected to arrive within a few hours. The contours of the land and the snow-covered summit of the Snaefells Jokull showed up almost unbelievably near.'**[23]

Doesn't CPT Bartlett's testimony sound identical to that of CPT MacMillan? The only difference is that we know what land CPT Bartlett saw, and its distance. He also verified that he could easily recognize the Icelandic landmarks. Also note the amazing distances. The actual objects were between 335 and 350 mi away, yet they appeared to him as if they were really close at hand. He was an experienced polar sailor, and yet he had not seen such a clear mirage in his life. Even so, the distances over which it was seen are mind-boggling, just like the mirage of Tahiti.

Bartlett was at sea level, of course, yet he could see a mirage of an object almost 350 mi away. MacMillan said Crocker Land was at least 200 mi from shore. Could this mean that Crocker Land lies approximately 350 mi away from Cape Thomas Hubbard and Cape Colgate? The Russian coast is more than 1,500 mi away, so the Crocker Land mountains obviously can't be Russian. I have already mentioned the brightness problems associated with such tremendous distances. Crocker Land must therefore lie in the mid-Arctic to the West of the North Pole.

Bartlett's description of the Icelandic mirage, occurring under polar conditions, matches, in every respect, what MacMillan said about Crocker Land. Bartlett was able to make out the finest of detail and to observe the color contrasts. We are therefore able to establish that under certain strange atmospheric conditions, a mirage can be magnified to make land appear to be ten or more times closer than it really is. But if this is so rare, why does it occur so frequently in the vicinity of Crocker Land?

Why isn't Crocker Land on our maps by now? Even if MacMillan did not find it, surely, the USAF or US Navy should have found it decades ago?

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What of the extensive Russian sea and air searches for Sannikov Land earlier this century? Did they also come up empty-handed? Or did they find something they would rather keep under wraps? The Russian and American military have scrutinized every square inch of the polar regions. Maps made of the Arctic Ocean sea floor by nuclear submarines of the US Navy were classified for 25 years. Could it be that Crocker Land does not technically belong to the outer surface of the world? Could it be that Crocker Land lies "below the surface" of this Earth? Could it be that some strange geographic and atmospheric conditions exist there which exist nowhere else on Earth? Could it be that Crocker Land lies in a Polar Hole?

Now let's think about that. Remember the debate I mentioned regarding warm or cold air exiting from an Inner Earth? Arctic mirages occur early in spring and summer in this region where MacMillan and Peary were. Peary saw Crocker Land in June, while MacMillan saw it at its finest in April and May.

The geography of a Polar Hole must have some effect on temperature and weather in the vicinity. For example, would that land not lie in eternal darkness throughout winter? And what of the temperature of the air coming from inside the Earth? Could this create a natural, circular belt of air above, and around a Polar Hole? Could air from inside the Earth create a naturally occurring temperature inversion in such a hole? Would this mean that light from Crocker Land, Sannikov Land and Keenan Land always passes through certain layers which refract the light in a certain way? Are the temperatures there causing light to be refracted along the curvature of the Outer Earth?

According to the various accounts I have presented, the Polar continent seems to be enormous in size. Does the circular rim of a hole also have a circular layer of air of a certain density which then causes a natural focusing effect on light passing out of it? Could it result in greater lateral magnification thereby making the land appear wider than it really is? Would this explain why Crocker Land covered such a large frontage?

Finally, why is the lower, inverted image, of Crocker Land never seen?

Take a look at Figure 16.2. Here we see a simplistic drawing which shows how a superior mirage is created. It shows how various rays of light from a mountain are curved, so that an observer imagines he sees a distorted, upside-down image of the mountain, as well as another image of it above it. T1 and T2 represent rays of light from the top of the mountain which move along different paths and are then refracted differently. B1 and B2 represent

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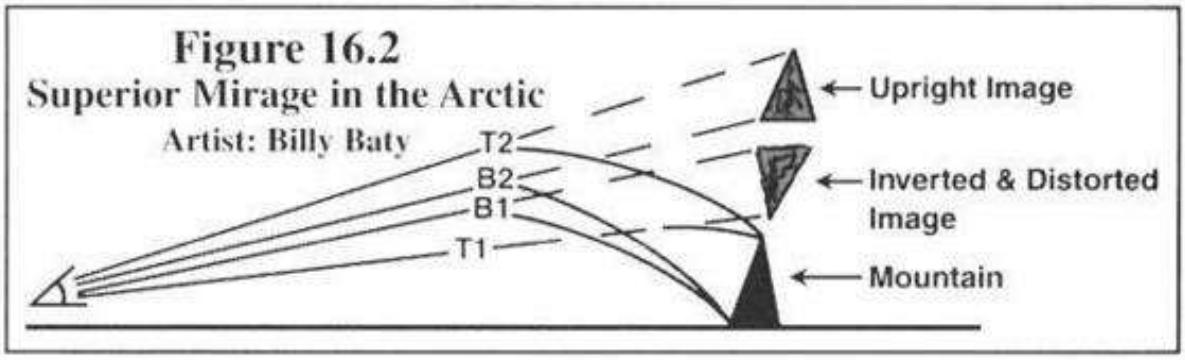
rays of light from the bottom of the mountain. The solid lines represent (more or less) the actual path of the light. The dashed lines show us where the human observer thinks the light is coming from.



Remember that anomalous Earth curvature which I hunted for so fruitlessly? Well, maybe I've found it. What would happen if this mythical mountain existed inside a Polar Hole where the curvature is much more pronounced?

Take a look at Figure 16.3. Could it be that the anomalous curvature of a Polar Hole blocks the rays of light which would normally form the lower inverted distorted image in a superior mirage? In Figure 16.3, we see light rays T1 and B1 being so refracted that they are never seen by the human observer because of the curvature of the Earth in the vicinity of a Polar Hole. On the other hand, rays T2 and B2 are so refracted that they take a higher path through the atmosphere and they are then seen by the observer. Thus, only the upright and clearer image makes it to the observer's eye. Could this be the scientific explanation for Crocker Land, Sannikov Land and Keenan Land?

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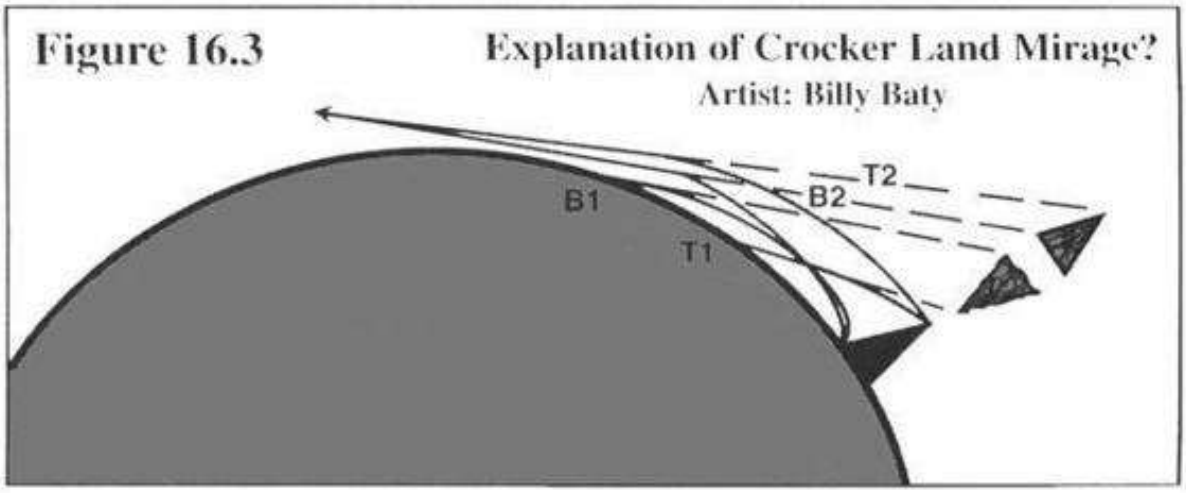

Remember how MacMillan scanned Crocker Land and could never, by vision alone, determine that it was a mirage? He never saw the upside-down, distorted image which is normally seen. He only saw something which was very clear, upright, and highly magnified. Perhaps he was seeing a natural effect created by looking at a land which lies inside a Polar Hole? If this is so, then we may have an explanation for Crocker Land.

This explanation neatly dove-tails with my other thoughts which suggest that Crocker Land lies much further away than even MacMillan thought. Crocker Land could be 350 mi, and perhaps even more, away from where MacMillan saw it on 21 April. The behavior of the pack ice also suggested that MacMillan was still far away from land.

Let us suppose someone were to set out towards Crocker Land and they did not turn back. At first they may see it from time to time, as the weather allows, as clearly as MacMillan and Peary did. As they approach it and begin entering the Polar Hole, they will see it gradually rising in the sky. Below it, gradually rising also, will be an inverted and distorted image of Crocker Land. By now they should be seeing the mirage much more often. But Crocker Land will still be far away. They will need to travel further still. And as they do so, they will see both images still rising, and below these images they will see the Crocker Land mountains—for real.

What will they find on Crocker Land when they finally set foot upon its shores? As they wander through its hills and valleys, will they meet Eskimos who technically are dwellers of the Inner Earth? Will these Eskimos be able to direct them to the City of Shamballa?

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Chapter 17: The Hole through the Earth

Dr. Frederick A. Cook is the most discredited explorer in all of Arctic history. Cook was so thoroughly discredited that I never once thought of even looking into the issues regarding his claim to have reached the North Pole before Peary. It was only while paging through Wally Herbert's *Noose of Laurels* that I saw Cook's map of his attempt on the North Pole. As I looked at this map I noted the proximity of two large pieces of land which can no longer be found on any map: Crocker Land and Bradley Land.

While Wally Herbert was busy trying to destroy Peary, he paused to take a final swipe at Cook. Herbert is not alone in this endeavor. Another author, Robert M. Bryce, wrote a book recently called *Cook and Peary: The Polar Controversy, Resolved*. Both Bryce and Herbert reiterated the charges of fraud against Cook. This came in the form of Eskimo testimony which went against Cook. The very Eskimos who accompanied Cook on his North Polar attempt had stated that Cook had never reached the North Pole. This, so they believed, sealed Cook's fate. Strangely enough, all these people who question Peary's attainment of the Pole myopically ignore the Eskimos, and the black man, Mathew Henson, who accompanied Peary. The testimony of Henson and the Eskimos was not considered good enough by all those who chose to attack Peary. Yet, in the same breath, people quickly embraced the testimony of two Eskimos to try and shoot Cook down in flames.

As I poked my nose into the Cook affair, it all seemed as if it would be such a hopeless waste of time. But it was Wally Herbert who again proved to be the conduit for what was to happen next. As a footnote, Herbert stated that the Frederick Cook Society still believed in Cook. The Cook Society? Did somebody really care about Cook after all these years? How could anyone dare to show their faces in public and still try to clear the name of the most discredited Polar explorer of all time?

I brashly set upon the Cook Society and asked them how they could possibly defend Cook. He had been slated from the start. The vast majority of commentators had declared him a fraud. Furthermore, he seemed to exhibit a pattern of such behavior. He claimed to have been the first to climb Mt.McKinley, which is the highest mountain in North America. This claim had been refuted as well. Cook had even been sent to prison for mail fraud.

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Cook really was a basket case.

Russell W. Gibbons is the President of the Frederick Cook Society. I asked him why people were still trying to defend Cook. In an e-mail dated 3 June 1998 he replied:

> I cannot answer 'why people are still defending Cook' if they have not read the literature and especially the pattern of dismissing him as a charlatan, **when world class explorers and geographers still find him credible.** Our (the Society) work of 50 plus years has essentially been to act as a clearing house for those experts. . . who have done the basic work.

In a fax to me, he expressed the view that Dr. Cook's Bradley Land might not have been a real island, but was instead a glacial ice island.

In Wally Herbert's book I found two very interesting pieces of evidence: Cook's map of his journey, and a photograph of Bradley Land. Neither Crocker Land, nor Bradley Land, exist on any current map. My curiosity revolved around the proximity of these two pieces of land which were independently "discovered" by the most prominent polar explorers of the time. Was this just an accident or was there more to this apparent coincidence than met the eye?

My interest in Dr. Cook thus revolves around the problem of Bradley Land and its possible relation to Crocker Land. Since Dr. Cook is such a highly discredited figure, it is necessary to gain a much deeper understanding of him and his achievements in order for us to reach a reasonable conclusion regarding Bradley Land.

BIOGRAPHY

Frederick Albert Cook was born on 10 June 1865 in Hortonville, New York. He was the youngest of five children. His father, Dr. Theodore Koch was an immigrant German physician who served in the American Civil War. His father died when he was only five years old. His family then moved to Port Jervis and later to Brooklyn, New York. His childhood and adolescence were characterized by hard work and dedication to the welfare of his family. Cook managed to earn enough money to attend medical school, graduating with an medical degree from the College of Physicians and Surgeons of the University of New York.

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As a young man Cook suffered from wanderlust. He began volunteering to assist in various expeditions, normally without pay, and sometimes even at his own expense.

In 1891, at the age of 26, he was the surgeon in Peary's North-Greenland Expedition. Peary and Cook were later to become bitter enemies. During this expedition Peary was involved in a serious accident which Peary described in his own words as follows:

> About eight o'clock on Saturday evening, 11 July, the Kite being then engaged in ramming a passage through some comparatively heavy ice, I stepped to the stern rail as she was backing for another blow, to watch her behavior. Just as I reached the rail a large cake of ice struck the rudder, jamming it hard over, and tearing the wheel from the hands of the two men on duty. One of them was thrown clear over the wheel and across the deck. The next instant the iron tiller had caught my leg between it and the house and snapped both bones just above the ankle. I spoke to the men at the wheel, asking them to send Doctors Sharp and Cook to me, and the next instant they and Gibson were carrying me to the cabin, where I was stretched out on the table. My leg was set and I was stowed on a long seat across the head of the cabin, where I was destined to remain till I was taken ashore at our winter camp. **Thanks to the professional skill of my surgeon**, **Dr. Cook**, **and the unwearying and thoughtful care of Mrs. Peary**, **my complete recovery was rapidly attained**.[1]

Peary attests to Cook's eagerness and courage. One day he addressed his fellow explorers, calling for two volunteers for a difficult and dangerous journey:

> I told them they had now been on the ice cap long enough to know what it was like, and to understand that it was no child's play. I told them that once started there could be no turning back. I also told them that too many it would seem a dangerous and foolhardy thing for two men to strike out into these unknown regions, dependent only upon their own resources and health for a safe return; that for myself I did not consider it dangerous, but that each man must decide for himself. **The Dr. [Cook] was the first to volunteer**, **but Gibson and Astrup were close**

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behind him.[2]

They had good times in those early days. Peary described a humorous incident:

> 13 January was diversified by a small fire scare. Astrup knocked a box of matches from a shelf on to and around the stove. They immediately took fire in every direction, and Dr. Cook, who had the night watch and who was asleep in the bunk nearest the stove, sprang out in his sleeping bag and fell, half-awake, on the matches on all fours, just in time to encounter, full in the face, a pailful of water which I had thrown from the opposite direction. The second pailful following fast upon the first, convinced Dr. Cook of the efficiency of the fire department and caused him to retreat in confusion. The third application of water extinguished the blaze.[3]

In browsing through Peary's book *Northward over the Great Ice*, I could find no references to differences of opinion or fights between any of the men. Instead, Peary described another moment of merriment as they tumbled down a hill on their skis with the Eskimos joining in the fun. These were good times where there was mutual respect between Peary and Cook. Peary commented upon Dr. Cook's contributions to the expedition:

> To Dr. Cook's care may be attributed the almost complete exemption of the party from even the mildest indispositions, and personally I owe much to his professional skill, and unruffled patience and coolness in an emergency. In addition to his work in his special ethnological field, in which he has obtained a large mass of most valuable material concerning a practically unstudied tribe, he was always helpful and an indefatigable worker.[4]

After the North-Greenland Expedition, Cook went on to accompany other expeditions. He is credited with saving the Miranda expedition when he sailed ninety miles in the icy waters off the coast of Greenland in an open boat.

Back in the USA his star was also rising. His medical practice in Brooklyn became ever more prosperous. He also became the President of the Arctic Club of America as well as the President of the Explorer Club.

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He was the medical orderly of the Belgian Antarctic expedition of 1897–9 to the Antarctic. They were the first to spend a winter in Antarctica. The first mate on this expedition was Roald Amundsen, who was to become one of Dr. Cook's most faithful friends. Their ship became stuck in the ice. Amundsen credits Dr. Cook with saving the expedition. He referred to Cook's "unfailing hope and unfaltering courage" in this dire situation. Cook not only devised a plan to extricate the ship from the ice, but he also nursed the entire party back to health from scurvy and anemia. For his role in this expedition, Cook was knighted by the King of Belgium.

As a result of his writings Cook became famous. He then set off to explore Mt. McKinley in the Alaskan range. It is the highest mountain in North America. In 1903 he carried out the first circumnavigation of it. He tried to climb it in 1903 and 1906. His companions in 1906 were Professor Herschel Parker, Belmore Browne and Edward Barrill. Parker and Browne turned back when the ascent seemed impossible. Cook and Barrill then tried again. Cook later published a book claiming he had reached the summit. It included a photograph purported to have been taken from the top of the mountain. Barrill contradicted Cook's statements. In 1912 Parker and Browne returned to Mt. McKinley and found the very spot from which the photograph had supposedly been taken. They also approached within 500 ft of the summit but were driven back by a storm. By their actions, Cook's claim was refuted. The summit of Mt. McKinley was officially first reached by the Stuck expedition in 1913. It should be noted that Cook's ascent of Mt. McKinley was only questioned later, after the North Pole controversy had begun. The two incidents are thus related with accusations of fraud from the one being used to bolster accusations regarding the North Pole.

He talked the millionaire John Bradley into organizing a hunting expedition to Northwest Greenland. It was from here that Cook was to later make his attempt on the North Pole. He sailed to Greenland on a ship named after his benefactor, John R. Bradley.

He left the last Eskimo village in February 1907. He only had two Eskimos with him for his assault on the North Pole. He claimed to have reached it on 21 Apr 1908. On his return journey he was cut off from reaching his food caches on the mainland. He was thus forced to undertake a circuitous and highly dangerous sledge journey back to Greenland. It resulted in him and his Eskimos spending a winter in the Canadian Arctic without food caches to assist them. They nearly perished.

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His excursion to the North Pole had thus taken him more than a year. On returning to Greenland, he told many people of his attainment of the North Pole, but he forbade them all, including the Eskimos, from telling Peary. He probably sensed that Peary would be extremely angry at being usurped by him. Dr. Cook then travelled to Europe. He was recognized as the discoverer of the North Pole by the Royal Danish Geographical Society in September 1909 and was awarded its Gold Medal in tribute to him for this achievement. The medal was presented to him in the presence of the King and Queen of Denmark, before a distinguished audience of scientists and scholars. He was acknowledged as the discoverer of the North Pole by the University of Copenhagen in September 1909. It also bestowed upon him the honorary degree of Doctor of Philosophy, the degree being presented to him by the Rector of the University, before an audience of 1200 faculty members, scholars, students and eminent guests.

But it was back at home in America that things were not going well at all. He found himself amidst a bitter and vicious controversy. Peary heard from the Eskimos about Cook's successful attempt on the North Pole. He immediately went on the offensive by sending messages back to the USA. Peary attacked Cook viciously and said he already had evidence from the Eskimos that Cook had never ventured far into the polar ocean.

According to Peary, the two Eskimos who had been with Cook, had already said that they camped out on the polar ice for several days before turning back. In later years, MacMillan (of Crocker Land fame) also interviewed the Eskimos. They told how Cook had camped some distance out on the Polar sea where they had then amused themselves by building igloos and wrestling, while Cook spent all his time writing.

Marshall Gardner, writing in 1913, informs us that Peary's vitriolic attacks against Cook, and his apparent arrogance did not serve his cause. Peary had also taken some of Cook's provisions which he had cached pending his return from the north. Cook was extremely angry over this and accused Peary of attempted murder. He claimed he and his Eskimos were at death's door from hunger when they reached Greenland. They had gone to where they had stashed several year's supply of food, only to find that Peary had already taken all of it. All of this created a great prejudice against Peary and for a time sympathy was on Cook's side, pending his submission of proofs.[5]

Gradually however, Peary and his friends' ongoing attacks on Cook

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began to gain ground. MacMillan, who had been tutored by Peary, and who was an ardent friend and admirer of Peary, claimed to also have spoken to the Eskimos regarding Cook's attempt on the North Pole. MacMillan backed up Peary's claims. It was claimed that Cook had faked the photographs taken at the North Pole. MacMillan claimed that Cook's photographs of Bradley Land had similarly been taken elsewhere. He claimed that the Eskimos told him the photographs were taken on Axel Heiberg island. Doubt was also cast upon Cook's photographs of the summit of Mt. McKinley and before long it was "proven" that he had faked all these photographs.

But worse was to come. In the 1920s, he entered the oil business in Texas as a petroleum geologist. He found himself in court on charges of mail fraud. He was tried and convicted of defrauding stock-holders by falsely asserting that there was oil on land owned by his company. He was sentenced to 14 years in prison. He only served seven of them. Sheldon Cook, the historian of the Cook Society believes he has proved that Cook's oil-field dealings were in fact legitimate. During the last 60 years billions of barrels of oil were pumped from this very land formerly owned by Dr. Cook's company.

Even in his darkest hours, some friends never abandoned him. His most loyal friend was the Norwegian, Roald Amundsen, who discovered the South Pole. They had served together on the Belgian Antarctic expedition and had become firm, life-long friends. Amundsen was clearly a man of great ability. The race for the South Pole was treacherous. The entire Scott expedition perished in 1912 on their return from the South Pole. Amundsen had beaten them to it. Admundsen regarded Cook as his tutor. He firmly believed, and stated, to the end, that Cook had indeed reached the North Pole.

In 1940, Cook suffered a very serious stroke. He received a full Presidential pardon from Franklin D. Roosevelt a few months before he died on 5 Aug 1940, at the age of 75. His cremated remains are at the Forest Lawn Cemetery in Buffalo, New York.

The Frederick A. Cook Society was founded in the year of his death. It consisted of expedition companions and other supporters. In 1956, Rear Admiral Charles W. Thomas, one of Admiral Byrd's navigators, became its President. It currently publishes an annual journal called *Polar Priorities*. The Cook Society was very helpful to me. I communicated extensively with its senior members and was supplied with numerous papers and information.

What impressed me the most about the Cook Society (apart from the

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quality of their information), was their forthright manner. I had expected to find a small group of people skulking in the shadows uttering embittered words and having little or nothing of substance to back it up. Instead, I found them to be forthright. They did not dodge issues when I asked hard questions. They answered my questions and often supplied much more information than I had asked for. To me, this was a good sign—a sign that they knew what they were doing, that they were honest, and that they had a solid case.

Unfortunately, space in this book does not permit me to print the vast body of literature they supplied me with. I will however refer to their various papers which any interested parties can obtain from directly from them. I have done my best to summaries the most important aspects as they relate to the problem which I am currently studying. It will give the Reader a good appreciation of the high standard of work done by the Cook Society.

In recent years, reputable Polar journals have been calling for a reexamination of Dr. Cook's work. The Russians, who have never been slouches in polar work, have also recognized the contributions of Dr. Cook. In 1965, a century after he was born, the New York State Legislature honored his work. In 1993, the Byrd Polar Research Center at Ohio State University hosted a symposium called "Cook Reconsidered: Discovering the Man and His Explorations." One Polar scientist and author, Jean Malaurie, stated that Cook was the most defamed man in Arctic history. He likened him to a "Bonaparte on ice" at the time of the discovery of the North Pole.

MOUNT McKINLEY

Cook's opponents like to use Mt. McKinley as supporting evidence for the claim that he never reached the North Pole. They portray it as part of a pattern of deceptive behavior. The Mt. McKinley episode is important as another measure of Dr. Cook's credibility and of his ability as an explorer. There are some aspects of it which also help to shed some light on the North Pole controversy.

Wally Herbert makes the observation that the first allegations against Dr. Cook's ascent of Mt. McKinley originated from Fred Printz who was described as an "untutored horse-packer." Herbert notes that the story had aroused certain suspicions that this man was working at the behest of someone else with a vested interest in proving Peary right. Cook's biographer, Freeman, suggested that General Thomas H. Hubbard was behind

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the story and that money might have passed hands as an inducement for the story to be told to the *New York Sun*.[6]

The reason for this allegation was that Peary's claim to the North Pole was no stronger than that of Dr. Cook, and Peary's supporters needed something to give them the upper-hand. To many, Peary's claim on the North Pole was the weaker of the two. This is underscored by a poll conducted by the *Pittsburgh Press* at the time. It invited readers to submit votes as to who they believed had reached the North Pole first. The results from more than 76,000 votes were published on 26 Sept. It showed that a staggering 96% believed Dr. Cook had reached the North Pole before Commander Peary. 76% of respondents did not believe that Peary had even reached the North Pole.[7]

Most of the time Peary was his own worst enemy. His unbending will and his absolute unwillingness to demonstrate one ounce of goodwill towards Dr. Cook hurt him considerably. He received hate mail from strangers. He said his men were as responsive to his will as the fingers of his right hand. This arrogance outraged the American public. In Greenland Dr. Cook had entrusted his North Pole expedition's records to the care of a young American hunter by the name of Whitney. When Whitney returned to America it soon became public knowledge that Peary was the one who had prevented Whitney from bringing Dr. Cook's records back on the ship. Peary then issued a public statement attacking Dr. Cook for leaving his records in the care of another. This statement only served to further turn public opinion against Peary.

Peary was a man of steel. Many people were terrified of him, including Whitney, who had enough first-hand evidence to prove Dr. Cook right. Whitney knew both men, and was petrified of Peary. He did not want to get involved in the controversy. This explains why Whitney spoke out as little as he did. His reticence to act more decisively and strongly in support of Dr. Cook was to cost Cook dearly.

Even though Dr. Cook started with the advantage, he was to find it gradually being eroded from under him because his defenders were not as vigorous, nor as cunning as those of Peary. Peary's supporters told Peary to stop making public statements so they could gradually rehabilitate his public image while secretly mustering for the attack on Cook. Prof. Ralph Stockman, who had been with Peary on an expedition in 1896 added his voice to those who claimed Cook had never reached the summit of Mt.

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McKinley. Peary's supporters said that Cook's claim on the North Pole and on Mt. McKinley, were hoaxes perpetrated on the general public. They claimed there were parallels between the two. Dr. Cook, like Whitney, was also not prepared for the vicious and unrelenting attacks. The tide slowly turned against Cook as the public became enraged at the thought that he had hoodwinked them.

It was the beginning of the end for Dr. Cook. His supporters sensed this and began running for cover. The Danish explorer and anthropologist, Rasmussen, had very strong first-hand evidence in support of Dr. Cook's claims. He felt Cook was doomed, so he tried to extricate himself from the controversy by retracting his earlier proofs in favor of Cook. Whitney also ducked for cover.[8]

Many decades have now gone by and things have quietened down. The discussion is now academic since Cook and Peary have long since passed away. So what is our current state of knowledge regarding the Mt. McKinley controversy?

Dr. Ralph Myerson is a physician and a Clinical Professor of Medicine at Allegheny University Health Sciences Center in Philadelphia. He is also a student of Polar history and the Vice-President of the Cook Society. I asked him what the Cook Society had to say about the Mt. McKinley controversy. In an e-mail dated 19 Sept 1998 he replied as follows:

> **We have reams of data supporting Dr. Cook's successful attainment of Mt. McKinley's summit. His diary of this event was discovered in 1989**, **and using it as a guide**, **a group of expert mountaineers (including Scott Fischer who died on Mt. Everest in May**, **1996) subsequently were able to follow him successfully to over 13**,**000 feet**, **at which time they turned back.** There is no doubt about his successful circumnavigation of the mountain in 1903 when he reached an altitude of 11,000 ft. Although there is bitter dispute over his attainment of the summit, Sheldon and Ted Heckathorn (the leader of the Cook diary expedition) have written rebuttals to the objections and they will appear in the soon-to-be-issued *Polar Priorities* and I will make sure you get a copy.

Dr. Myerson then sent me the September 1998 issue of *Polar Priorities*. Sheldon Cook had written an interesting article regarding Mt. McKinley.

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It becomes evident that there is a considerable amount of friction between the Cook Society and a Prof. Dennis Rawlins. In 1973 Rawlins wrote a book wherein he disputed Peary's claim to the North Pole. Since then, Rawlins has also been tearing Dr. Cook apart, and Admiral Byrd's North Pole flight as well. Rawlins has accused all these Polar explorers of being unable to navigate! Rawlins does not believe these three men ever reached the North Pole. It is worth mentioning that LTC Molett's spirited defense of both Peary and Byrd was in response to these attacks. Molett, who has been a navigator all his life, defends them to the hilt. Rawlins is also not popular among the Cook supporters. In recent years a librarian by the name of Robert Bryce has joined in the all-out attack on Peary and Cook. Bryce and Rawlins have thus become allies. A third academic, Bradford Washburn, has spent much of his career attacking Dr. Cook as well. It should be said in Bryce's favor that he is not a zealot like Rawlins and Washburn, both of whom sometimes have a rather casual adherence to the facts. On some occasions he has taken them on their word when in fact they were wrong. Bryce's errors seem to be genuine, whereas Rawlins and Washburn seem to have an agenda. They seem to ignore facts which do not suit them, whereas Bryce seems to be engaged in a much more genuine search for the truth. Bryce has actually made a number of interesting and useful discoveries.

Both Rawlins and Washburn have made provably false statements about Dr. Cook on various occasions. For example, in 1989 Washburn produced a map of Dr. Cook's ascent of Mt. McKinley. When Ted Heckathorn ascended Mt. McKinley in 1994 he discovered the following errors:

> It greatly distorts the East Ridge and makes other errors. For example, the heavily crevassed glacier we ascended in 1994, apparently does not exist. We wasted a lot of work (and expletives) making a first ascent of that 'non-existent' glacier. Curious about what a 'non-existent' glacier looks like? See Cook, *To the Top of the Continent*, 1996 edition, plates 2/9 and 2/10.[9]

Washburn also claimed that Cook ascended Mt. McKinley without gloves or mittens. Unfortunately for Washburn, his ally, Bryce, uncovered a photograph taken on Mt. McKinley which showed Dr. Cook's tent and gloves hanging on a rope to dry![10]

Ted Heckathorn had this to say about Washburn in 1997:

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> During the past two years we have witnessed Dr. Cook's narrative under its heaviest attack since 1910. Remarkably, Dr. Cook has emerged from this renewed assault in a far stronger position than when he started. The most interesting development is Brad Washburn's losing control over the controversy for the first time in over 40 years. In spite of his furious efforts his iron grip has slipped, and nearly all of his favorite arguments against Cook have floundered in the light of new investigation.
>
> Although a relative newcomer to the contest, Bryce destroyed two of Washburn's favorite weapons—the alleged Yaghan Dictionary heist and the allegation that Cook never protested to anyone about the errors in *To the Top of the Continent*. Bryce also raised an interesting point about Cook's early media comments about the summit conditions. Washburn's false statements about McKinley's summit conditions and the changes in the Abruzzi Ridge of Mt. St. Elias have further eroded his position.[11]

The sad fact is that people like Rawlins, Washburn and Bryce often get media attention given to their views whereas the defenders of Cook often get the cold shoulder. Bryce, Rawlins and Washburn have tried to attack Dr. Cook's claim to have climbed Mt. McKinley. In recent weeks Bryce was quoted by the *New York Times* on exactly this subject. However, the "evidence" presented by Bryce and mentioned by the *New York Times* is nothing more than a rehash of old Peary propaganda against Cook from earlier this century. Even Wally Herbert, who has very little kind to say about either Cook or Peary makes the case that Peary and his supporters went to great lengths to destroy Dr. Cook.

As Dr. Myerson mentioned, some very interesting information has come to the fore in recent years. One of these developments is the discovery of Cook's Mt. McKinley Diary in 1989. On page 52 Cook drew a sketch of Mt. McKinley. Sheldon Cook comments:

> The sketch depicts features on the main mass of Mt. McKinley located beyond the East Ridge **which can only be seen from the crest of the East Ridge at 11,500 ft to 11,700 ft near Traleka Col. These features are not visible from below in the approach to the mountain up Ruth Glacier because they are hidden by the East Ridge which towers between Ruth Glacier and the central massif. They were unknown**

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> **before Cook sketched them in September 1906**, **no climber or explorer had reached that point before him**.

Barrill was the guide who accompanied Cook on this expedition. Later Barrill stated that they had never climbed Mt. McKinley. He claimed that he and Cook had only reached 5,000 ft and then returned to their base camp. However, as Cook's sketch shows, they must have reached an altitude of at least 11,700 ft. Sheldon Cook writes

> We now know beyond a doubt that Barrill swore falsely when he alleged that Cook turned back at. . . 5,000 ft, and this vastly increases the possibility that he also lied when he asserted that Cook did not reach the summit.

Bryce attacks Cook on the basis of some of the photographic evidence which shows features which all lie at the lower levels of the mountain. Bryce also states that it is not possible for Cook to have climbed the mountain in a mere eight days.

Sheldon Cook counters Bryce's allegations by pointing to the significance of the sketch on page 52 as well as many other entries in Cook's diary which suggest that he reached high altitudes and saw many things from close-up. Cook apparently complained that his publisher had made a number of mistakes by putting the wrong captions on some of the photographs. The publisher had also left an entire chapter out of the book.

Another very convincing observation in favor of Cook pertains to his estimate of the distance between the North and South Peaks. In his book, Dr. Cook asserted that these peaks were 2 mi apart at the top of Mt. McKinley. For many years it was believed that the two peaks were actually 4 mi apart. It is only in recent years when modern surveys of the area were conducted that it was established that the distance between these peaks was in fact 2 mi—just as Dr. Cook had said back in 1906![12]

Some very strange events took place earlier this century. Exactly how and why Cook's companions were convinced to turn against him remains a mystery. But, some of them admitted to it in their own words. Belmore Browne is another of Cook's Mt. McKinley companions who turned on Cook. His own letters suggest to me that someone put considerable pressure on him to turn against Cook. Was this Government or Military pressure?

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Take a look at a few short excerpts from letters between Browne and Edwin Balch. In a letter dated 17 Mar 1915, Browne wrote:

> Dear Mr. Balch, I finished a short time ago your book entitled *Mt. McKinley, and Mountaineering Proof. . .*
>
> **I have always regretted that the greater part of the burden of disproving Dr. Cook's claims fell on me**, and the task of attacking a former comrade was so distasteful to me that, in my lectures as well as my articles, I have stated the case as shortly as was possible. . .

Browne went on to say that he had not publicized all the information at his disposal.

Edwin Balch replied on 19 Mar 1915 as follows:

> Dear Mr. Browne, Your letter['s]. . . contents certainly surprised me. **If you have any evidence in regard to either the discovery of the North Pole or the first ascent of Mt. McKinley**, **it is hard to see why you did not publish it in your big book**, **and it would seem to me that you would want to publish it at once**. . .

I do not know what Browne's reply was, but in Balch's next letter to him on 1 Apr 1915 one can see that Balch is angry:

> Dear Mr. Browne, I am tired of your nonsense. You are certainly in a hole. My friendly advice to you. . . is:
>
> **Go and see Miles Poindexter**, **U.S. Senator**. . . **or Frederick A. Cook**. . .
>
> **Tell them the truth**, **the whole truth and nothing but the truth. Probably in the long run you will fare better than by sticking to those who put upon you 'the greater part of the burden of disproving Dr. Cook's claims.'**

The above letters can be found in The Cook Collection (#18/76) at the Ohio State University Archives. It would seem from the above that Browne was under some kind of pressure to lie about Dr. Cook. Who are these people

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who put Browne under this pressure? The bizarre fact is that these lies have since gone down in history as fact. Who put Browne and Barrill up to this and why?[13] The pressures on Dr. Cook continued throughout his life until he found himself in prison and his reputation lay in tatters.

Ted Heckathorn, like Wally Herbert, suggests that Peary was behind it. He writes:

> My own entry into the Mt. McKinley controversy occurred through a desire to collect the facts and discover what really happened. **While examining the Peary Papers**, **documents revealed that Peary's associates had bribed Ed Barrill to make an affidavit against Cook**, **and Belmore Browne lied to conceal his association with Peary.** If these folks resorted to such tactics to discredit Cook, could there be some merit to his claim?[14]

In a more detailed reference Ted explains:

> 2. Peary Papers, National Archives. The $5,000 bribe in 1909 would have about $250,000 of buying power in today's dollars. Possibly additional hush money was paid for Barrill's continued acquiescence, but the fiscal records of the Peary Arctic Club have disappeared. **Browne provided a receipt for funds he received from Peary**.[15]

This receipt for $5,000 was discovered in the Peary Papers when they were reopened after having been sealed for most of this century. Ted also mentions that Barrill was a blacksmith and that the only inducement which might interest him was money. Ted writes:

> In 1909, or soon thereafter, Barrill suddenly became prosperous, acquiring a new five bedroom home, an automobile (the first one in Darby, Montana) and cash. All of this occurred only after he decided that he really had not climbed the mountain after all. Bryce verified that Barrill received no special payoff in 1906, but he did in 1909 from anti-Cook sources.[16]

It should be noted that Barrill's sudden wealth coincides nicely with Peary's propaganda campaign against Dr. Cook's North Pole claims.

There seems to be a tremendous pressure on various people to hide the

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truth—and more amazing, it continues to this day. Ted Heckathorn organized an expedition to climb Mt. McKinley in 1994, to test Dr. Cook's Diaries. Consider the following observations by Ted:

> Since our return, the reaction to our expedition has been remarkable. **Extensive efforts have been made to censor and stifle our findings. Some members of the expedition were threatened with loss of their livelihood if they did not retract their public statements. When I organized a symposium of the top experts on the East Ridge of Mt. McKinley**, **extraordinary efforts were made to intimidate speakers**, **sabotage the event**, **and when that failed**, **to disrupt the meeting. One can only marvel at such manifestations of academic freedom and the concept of an open debate of opposing ideas**.

Prof. Rawlins and Bryce write articles for a publication which the Cook Society members refer to as: DIO. Ted then makes these strange comments regarding DIO:

> In regards to the DIO articles, **it does seem ludicrous that two individuals in Maryland**, **who have never seen Mt. McKinley**, **have the audacity to tell us what we saw and did not see on the Ruth Glacier and the East Ridge of the mountain. Perhaps they have developed supernatural visual abilities to see geographical features thousands of miles away.**[17]

In the references at the back of Ted's article one finds his views of Rawlins and Bryce dripping with sarcasm at the suggestion that these two would have the arrogance to suppose that they know more than Ted and his team who actually stood on the spot:

> 4. From atop the East Ridge we were unable to see or photograph the upper Muldrow Glacier. The Karstens Ridge and Pegasus Peak and its ridge blocked the view. Unfortunately our human eyesight and ordinary cameras were inadequate to penetrate through the ridges. Chalk up another score for the publisher of DIO since Dr. Cook 'suspiciously' could not see through the ridges either."[18]

Dr. Cook and Barrill travelled very lightly when they ascended Mt.

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McKinley in eight-and-a-half days. Ted Heckathorn makes a number of pertinent points regarding Mt. McKinley:

> 1. If we are to believe the Barrill affidavit, then two tough, experienced mountain men traveling Alpine-style, dawdled along at a speed of about 2 mi a day for no apparent reason. Such minuscule distances on the Ruth Glacier are absurd for anyone traveling Alpine-style. . .
>
> 3. Neither Cook's 1906 photographs nor ours in 1994 and 1996 show any significant crevasses on the main glacier in the vicinity of the Gateway. . . Yet, that is where the 1909 Barrill affidavit claims that large crevasses forced their return. All of these photos clearly and decisively refute the 1909 affidavit allegation. There was absolutely no reason to stop at that point and every reason to continue up the Ruth Glacier to the East Ridge even if they were not planning to climb to the summit.
>
> 4. Bryce's own research verified that Cook had commented in a private letter about the editorial errors that had occurred in his book and that editors had omitted one whole chapter. After Peary instigated the twin controversies and media attack in 1909, Cook realized the futility of trying to correct the errors.[19]

From all this it can be seen that many people, most especially Peary, had much to gain from discrediting Dr. Cook. In fact, discrediting Cook might have been the only way Peary could hope to win. What is quite astounding is how low they stooped in order to get their way. Strangest of all however, is the manner in which there seem to be certain forces at work to this day to ensure that Dr. Cook's reputation is never revived. The almost religious zeal of Prof. Rawlins and Washburn boggle the mind. Do they really believe so strongly in the evidence against Cook, or, like Browne and Barrill, are they working at someone else's behest? It is hard to imagine that something can be so important that 90 years later pressure is still brought to bear on whoever dares to actually go to Mt. McKinley. What is so very important that it needs to be hidden for so long? Or is it that a sincere enquiry into Dr. Cook's polar work will perhaps uncover something so amazing as to bring our entire civilization to a standstill?

COOK'S HUMAN RELATIONS

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So far we have discussed Cook's abilities as an explorer. But in pondering his fights with Peary it is worth considering him as a human being. He was trained as a medical doctor. What was his attitude towards his fellow creatures? Was he the type of person disposed to lying and taking advantage of them? Peary and his supporters, have made the case for decades, that Cook is a liar and a fraud. They portray him as a bumbling fool, intent on the most childish sort of cheating. History portrays Cook as a con-man who perpetrated one great fraud on the heels of another. Cook is depicted as a man without any standards, without any shame, without any decency whatsoever. Is this a correct assessment of him?

Prof. Ralph Myerson kindly sent me information regarding Dr. Cook's contributions to medicine. Cook was often brave and innovative. It is worth considering his actions and some of his deeper thoughts. I have wondered to myself whether Dr. Cook was an unrecognized genius. Could envy be the real reason he was brought down? I say this because Cook's detractors (e.g. Peary, Herbert, etc) say that the things Cook claimed to have done "were impossible." Many people have said this of his ascent of Mt. McKinley for example. Yet, in the final analysis, these things were not really impossible at all. So I wonder if envy motivated these people, simply because Cook managed to do what they could not.

Peary's sledding speeds to the North Pole were attacked on a similar basis. Peary was criticized for "going too fast." Could it be that some of the motivating force behind this criticism is personal pride? Could it be that someone like Herbert, was jealous of the fact that he and his team could not match Peary's speeds and so turned on Peary? When one considers issues such as world-wide acclaim, one has to consider that pride may be a factor at work. Could it be that some of our modern-day explorers just could not match the achievements of some of these greats from the past and are bitter about it? I think it is a fair question to ask. Peary spent many years in the Arctic and was a hardened man. Maybe he could do things back then which those of today would struggle to do, especially if they labored with the same type of equipment he had.

By today's standards many of the achievements of the past were virtually impossible. Some of the explorers of the past were regarded as being ill-clothed by current standards. No one today, no matter how brave, would face the Arctic with equipment as primitive and poor as those of the past had. Peary, for example, had to have eight of his toes amputated due to frostbite.

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All he was left with were stubs for toes and yet he still continued. Amputation of toes and fingers was quite common in those days. How many of today's explorers would consider driving themselves to such an extent? Let's face it, many of today's Arctic travelers are wimps by comparison to those of previous centuries. Entire expeditions died in the process of seeking out new things. Today such things are almost unthinkable.

Could it be that someone like Herbert is jealous of Peary, and Peary in turn was jealous of Cook? Women often comment upon the male ego. Could the underlying root of many of these ugly actions be nothing more than the male ego at work? These are thoughts worth pondering quietly in addition to the greater physical evidence presented here. Human emotions have caused wars and other problems in the past. Sometimes people can't accept some deep truth about themselves, and so they turn on others and attack and blame them in a conscious or unconscious effort to absolve themselves of responsibility and blame. You only have to look at the way those most insecure of people, politicians, often behave in the real world. Many of them would rather slander another than admit the truth about themselves. Isn't that so?

I have wondered if Dr. Cook was a rare bird; a man of great compassion and tremendous ability. Here is what Prof. Myerson sent me regarding Dr. Cook's contributions to medicine:

> Initially, Dr. Cook's medical practice was a failure, and this ill fortune was compounded by the death of his young wife in childbirth along with the newborn baby. In 1891 he joined Robert E. Peary's expedition to North Greenland as surgeon, photographer and ethnologist. During the 14 months spent in Greenland, Dr. Cook amassed a wealth of information concerning survival in the Arctic. He was especially interested in the life style of the North Greenland Eskimos and did extensive studies on them, especially on their resistance to scurvy and their behavior during the months of darkness they experienced.
>
> Dr. Cook joined the Belgian Antarctic Expedition in 1897 and made noteworthy and life saving contributions to the success of the Expedition. Without exception, the officers and crew became depressed and even psychotic during the darkness of the first Antarctic wintering. Based on his North Greenland experience, Cook correctly assumed that

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this was due to deprivation of light, and successfully treated the men by exposing them to the light and heat of the cooking stoves, the first such treatment for the seasonal affective disorder (SAD). When scurvy became a threat to the crew, he introduced partially cooked penguin and seal meat into the daily diet with success in the prevention and treatment of the disease. Although other explorers had noted the value of fresh food including meat in the prevention of scurvy, Cook was the first to theorize that something vital to our health was destroyed in the cooking and preservation of food. **This was**, **of course**, **Vitamin C which is destroyed by heat**, **but this was 20 years before it was recognized that scurvy was due to a dietary deficiency and 40 years before the isolation of Vitamin C**.

During the Belgian Antarctic Expedition, Dr. Cook made important innovations in the construction of tents, light-weight sledges, protective clothing, and sun glasses.

He was also instrumental in freeing the ice-bound 'Belgica' by suggesting and supervising the construction of channels in the ice leading to open water. **Roald Amundsen**, **the first mate aboard the 'Belgica'**, **regarded Dr. Cook as his mentor**, **and developed a firm**, **life-long friendship that endured during Dr. Cook's later trials and tribulations. In 1901**, **Dr. Cook sailed to Belgium where he and the rest of the 'Belgica' officers received several awards including the coveted Order of Leopold.**

Later in 1901 he responded to a request from the Peary Arctic Club to join a relief party to Greenland and perform a physical examination on Peary. There was concern because Peary had been in the Arctic for four years and hadn't been heard from in two years. **Although a rift had already developed between the two men**, **Cook agreed**, **and performed a remarkably thorough and accurate examination on Peary at Etah. He is said to have made the diagnosis of pernicious anemia**, **the ultimate cause of Peary's death and recommended that Peary eat a large amount of liver. This was 20 years before Minot and Murphy were awarded the Nobel Prize in medicine for recommending liver as a treatment for pernicious anemia**.

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During his incarceration at Leavenworth Federal Penitentiary, Dr. Cook rendered valuable medical care to his fellow inmates, about a third of whom were drug addicts—'hop heads' as the rest of the inmates called them. Looked down upon by both prison personnel and inmates alike, they were thrown into a common housing unit called the 'bull pen' which was located on the top floor of the prison. The only modicum of treatment afforded them was scopolamine, but when its sedative effects abated, their sub-human shrieking and wall beating were clearly heard on the floors below.

[Cook wrote:] **'I was led to believe that modern civilization is going under the cloud of a plague**, **more destructive in its economic strain that of all the wars in history. The opium blight**, **if not checked**, **will eventually sap the life blood of half of mankind.'**

Dr. Cook developed a treatment plan for the addicts which was based on non-specific supportive measures of water, exercise, sunlight and fresh foods plus a program of lectures and assistance aimed at rehabilitation. It may well have been one of the first such programs. He was quick to recognize that his program was a crude regimen of therapy. Although it seemed to decrease the physical manifestations of the addiction, he realized that it did nothing to remedy the underlying mechanisms responsible for the addiction. In this regard, he wrote: **'These men are the product of social disorganization. If something is not done to correct this disaster the gulf of modern civilization will be filled in and obliterated by the drug-shot dead. But what can be done? Condemnation**, **abuse**, **isolation**, **punishment never has and never will salvage human derelicts. There is no drug cure for the habit and there probably never will be. It is not difficult to take the patient from the habit and place him back in society as a fairly normal individual but the great unsolved problem is to devise means to keep him there and away from drugs.'**

Despite the controversy that surrounded Cook during his later life, even his critics and detractors are ready to recognize the above contributions made by him.

The wisdom and deep empathy which Dr. Cook had for his fellow man

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is clearly evident in his writings regarding the drug culture. He clearly foresaw, and understood, the great problems which challenge the society of today in this regard.

The manner in which he helped drug addicts in prison is particularly touching, especially when one considers that he was the target of a nasty campaign to destroy him. The above also shows that he did not hesitate to help Peary even though there was already a rift between them. Dr. Cook's behavior towards his fellow man seems to be above reproach. Even in his darkest hours, he did not seem to harbor hatred or bitterness towards his fellow creatures. That to me, speaks very highly of his character.

The Cook–Peary enmity contrasts strongly with the deep friendship which existed between Cook and Amundsen. Amundsen even came to visit him in prison. Amundsen was always a loyal friend and never forgot his mentor. That someone of the caliber of Amundsen should remain friends with Cook through thick and thin, to the bitter end, speaks volumes. If Cook was the bumbling childish cheat which Peary's supporters claimed he was, then surely Amundsen would have seen this and agreed with it? Yet, Amundsen always believed, to the end, that Dr. Cook had indeed reached the North Pole first. Amundsen once remarked that Dr. Cook was: "The most extraordinary explorer I have ever met."

DID COOK REACH THE NORTH POLE?

A few years before Dr. Cook died he wrote the following:

> I have been humiliated and seriously hurt. But that doesn't matter anymore. I'm getting old, and what does matter to me is that I want you to believe that I told the truth. I state emphatically that I, Frederick A. Cook, discovered the North Pole.[20]

Did Dr. Cook ever reach the North Pole? This question interested me as a measure of his credibility. If he did indeed reach the North Pole, then one could take his other thoughts and observations seriously.

The Cook/Peary controversy has produced such an emotionally polarized atmosphere that there is virtually no middle-ground left. You either hate Cook or you hate Peary. The Peary supporters do everything in their power to destroy Cook, while the Cook supporters in turn do their best to give Peary as little credit at possible. I understand and empathize with the

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Cook supporters' viewpoint because Cook is really the wronged party. Cook has been savaged and attacked without quarter. Yet Cook was a good man with a heart of gold, who did all he could for his fellow human beings. He did not deserve the ugly treatment he got. But, as sad and bitter as this scenario is, it does not help us in our scientific quest if we become too emotional about either Cook or Peary. Instead we must determine, in a cold manner, who was telling the truth about what. From that we can then draw new conclusions and attempt to determine what really happened, and what all this really means.

I spent that afternoon pondering what I had seen in Herbert's book. I had seen Dr. Cook's map on page 318 showing his attempt on the North Pole. Cook had travelled far to the west, to Axel Heiberg island and had then set out across the Arctic Ocean to reach the North Pole. He left Axel Heiberg from a point between Cape Thomas Hubbard and Cape Colgate—the same places from where Peary, and later MacMillan, saw Crocker Land. Peary's attempt on the North Pole came from a point considerably further east. On Cook's map one could see Crocker Land clearly marked, and north of it two land masses which he named Bradley Land. I was stunned by the realization that Cook had in fact been much closer to Crocker Land than Peary had been. Not only that, but Cook had marked new islands on his map. Stranger still, he had photographed Bradley Land! Cook later said that he had looked for Crocker Land, but that it did not exist at the location given by Peary. However, Cook had seen, photographed and pinpointed the location of Bradley Land. Neither Crocker Land, nor Bradley Land can be found on any maps of the Arctic today. I posed this question to myself: Had Peary, Cook and MacMillan all told the truth back then? Their testimonies are amazingly consistent and definitely complimentary. But if this is so, why are none of these lands marked on maps today?

In reviewing the evidence, I came to the conclusion that the only instance of lying seems to me to have been when Peary, with the connivance of MacMillan, set out to discredit Dr. Cook's claims to the Pole. Other than that, I found all the accounts to be largely supportive of one another. The behavior of Peary and MacMillan in vitriolically trying to destroy a fellow American is repugnant and disgusting in the extreme. As repugnant as it was, it does not necessarily follow that both were lying about Peary's achievements. It is possible that both Cook and Peary did indeed reach the North Pole.

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I set out to test my hypothesis that perhaps Cook, Peary and MacMillan were all telling the truth, except for the instance where Peary and MacMillan chose to gang up on Cook. I have come to the conclusion that this is indeed the truth. It is my opinion that LTC Molett's defense of Peary, and the Cook Society's defense of Cook are both factual and correct.

Having studied their accounts, I am of the firm opinion that there is missing land up in that region of the Arctic. I further suggest that Bradley Land may be distantly related to Crocker Land. The rediscovery of Bradley Land may go a long way to tracking the Crocker Land mirage back to its root. This should also lead us to finding out why these lands have been kept secret for so long. In doing so, I believe we will find that we have discovered a Polar Hole.

There has been much debate as to the real nature and location of the land which Dr. Cook plotted, photographed, and called Bradley Land. The anti-Cook crowd self-righteously point to maps of the Arctic and confidently state that there is no land there. The Cook supporters are at a loss to explain this land because it does not exist on any map. So they have tried various other solutions. One of these is to suggest that perhaps Bradley Land was an "ice island" drifting in the Arctic Ocean which Cook mistook for land. The Cook detractors have suggested that Cook really took the photograph of Bradley Land on Axel Heiberg island. I have yet to see a statement of the exact place where this photograph was supposedly faked. This assertion seems to be a bluff which has its roots in Peary's anti-Cook propaganda.

Let us examine a detailed paper produced by Sheldon Shackelford Randolph Cook, who is the historian of the Cook Society. In March 1998 he produced a paper entitled: *Frederick Albert Cook. Discoverer of the North Pole. 21 Apr 1908. A Statement of the Evidence*. He wrote:

> Historically, the strongest supporting evidence, the proof, the final confirmation of an explorer's claim to discovery has lain in the verification of his descriptions of the geographical area first seen, reached and traversed by him by later exploration. If his first and original descriptions of this region are confirmed and verified by later exploration, then his claim to discovery is validated and established; if not, then his claim is disproved or rendered questionable. The verification of an explorer's descriptions of the geographical region first attained by him by subsequent exploration in company with other

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> significant supporting evidence constitutes the full validation of the discovery asserted. **Frederick Albert Cook's first and original descriptions of physical conditions and natural features at the North Pole and in the region of the Central Arctic Basin through which he sledged have been confirmed and substantiated by later exploration in detail after detail**, a process that began with Amundsen's flight over the North Pole in the dirigible 'Norge,' which verified Cook's report that at the North Pole there is sea covered by the drifting pack ice of the Arctic Ocean, and has continued down to the present date. The verification of Cook's first descriptions of natural conditions at the North Pole and in the Central Arctic Basin, the strongest possible evidence in support of his attainment of the North Pole, **together with the First Testimony of the Polar Eskimos and the other pertinent evidence in the aggregate**, **cumulatively**, **establish and confirm Cook's Discovery of the North Pole**.

Sheldon then provides supporting evidence on a point by point basis:

> (a) The point of land from which Cook launched his march north across the pack ice of the Arctic Ocean was Cape Svartevoeg, now known as Cape Stallworthy, the northernmost peninsula of Axel Heiberg Island. Cook took photographs of Cape Svartevoeg while he was encamped there in March 1908, and a photograph of Svartevoeg is included in his book, *My Attainment of the Pole*, published two years after his return from the Pole. The headland in his photograph has been identified by later explorers as unquestionably Svartevoeg; furthermore, the photograph in his book shows his own streamlined sledges at the foot of the headland on the pack ice. Further, his description of Svartevoeg has been found to be correct in every detail. He left caches of provisions here to be picked up on the return from the Pole. (MacMillan verified, perhaps unhappily, the existence of these caches during his Crocker Land Expedition, but was careful not to expand upon the implications.)
>
> (b) Cook reported that from the point where the pack ice of the Arctic Ocean joined the land at Cape Svartevoeg north for a distance of approximately 50 mi, the pressure of the land against the ice had thrown up huge, jumbled mountains of ice. At 82° 23' N, he observed that he

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had passed beyond the zone of ice disturbed by land pressure. He also observed that beyond 82° 23’ N, the familiar pinnacles of very large icebergs were no longer seen. This is a correct description of the condition of the pack ice from land out for 63 mi or so and Cook’s description of the pack ice cover of the Arctic Ocean at this latitude and longitude have been verified.

(c) Cook reported that he reached the Big Lead at a point 115 mi north of Cape Svartevoeg. Modern exploration has determined that the continental shelf drops off sharply a short distance before this point is reached and that a sheer zone, the Big Lead, is, in fact, located there. Cook was precisely correct. Cook could not have deduced the location of the Big Lead from Peary’s 1906 reports. Had Cook attempted to fabricate the exact location of the Big Lead north of Cape Svartevoeg based upon information gleaned from Peary, he would have assumed that Crocker Land existed. This, in turn, would have required that the continental shelf be located further north than it in fact is and thus, the Big Lead further north than is in reality the case. **Cook correctly reported both the absence of land where Peary located Crocker Land and the precise location of the Big Lead approximately 115 mi north of Cape Svartevoeg. This is extraordinarily strong evidence that Cook was there**.

It is interesting to note that Cook reported that the pack ice from Cape Svartevoeg north to a point approximately 60 mi north of Cape Svartevoeg was marked by huge pressure ridges and numerous icebergs which were grounded and anchored.

‘The sea, as is thereby determined, is very shallow for a long distance from land.’[21] Modern exploration and cartography have shown that Cook was precisely correct.

Dr. Cook also observed that north of his third outbound camp on the pack ice of the Arctic Ocean at 82° 23’ Latitude N and 95° 14’ Longitude W, no further bergs grounded on the bottom of the sea were seen:

‘Looking northward, the skyline was clear of the familiar pinnacles of

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icebergs.’[22]

And this natural phenomenon, the absence of bergs anchored on the bottom of the sea north of this point, conforms to and reflects the physical fact, now known, that the continental shelf drops off sharply in this area, the sea radically deepens, and bergs do not founder because the sea bottom is too far below them. Cook accurately noted for the first time an important physical fact of the region through which he sledged.

(d) Crocker Land. North of the Big Lead, Cook began looking for Crocker Land, which Peary had reported that he had seen in 1906. **At the position reported by Peary and in its vicinity**, **Cook reported that he did not see Crocker Land. He was correct**, **of course**, **as Crocker Land does not exist.**

In 1913, **just prior to MacMillan’s departure for the Arctic for the specific purpose of proving the existence of Peary’s Crocker Land**, **Cook stated positively that there is no land at the location designated by Peary for Crocker Land. MacMillan found that Cook was right.** (Is it likely that the fabricator of a great North Pole hoax, conjuring up his imagined journey from the relatively safe and peaceful shores of western Axel Heiberg Island, would have missed the opportunity to remark that he had seen Crocker Land in the distance, particularly if the fabricator were as incompetent and bumbling as the Peary followers habitually depicted Cook?)

(e) As Cook sledged north across the pack ice of the Arctic Sea, **he saw to the west of his line of march between 84° and 85° N Latitude a low**, **ice-clad island. He did not touch this island at any point but merely saw it from a distance. He naturally assumed it to be an ordinary island of terra firma. Probably because there was little disruption of the ice visible between his line of march and the island**, **he believed it to be at a distance beyond the influence of land pressure—about 40 or 50 mi. He then calculated its probable size and elevation. Cook named this appearance of land on the western horizon Bradley Land**, **after a benefactor. Later exploration revealed that there is no land at the location designated by Cook.** Modern knowledge of the higher Arctic Ocean in the region between the

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Queen Elizabeth Islands and the North Pole indicates that Bradley Land probably was an ice island. Ice islands are large bodies of old, glacial land ice which have calved from the glaciers of Ellesmere Island, fallen into the Arctic Ocean, and become caught in its prevailing currents. **At the time Cook went North in 1907, these were unknown. They were rediscovered by pilots of the U.S. Army Air Force immediately after the Second World War and have since been visited and carefully studied by explorers and glaciologists. When Cook saw Bradley Land from a distance, he naturally concluded that it was an ice-sheathed island of solid earth and made his calculations accordingly.** Bradley Land was probably an ice island much closer to Cook's line of march than he assumed it to be and thus much smaller in mass and lower in height than he estimated. Furthermore, during the late 1940s and 1950s, the drift of the ice islands in the Arctic was plotted and patterns of drift established. Cook's Bradley Land lies within the drift pattern of at least one of the ice islands of recent times. It seems likely that it was an island of glacial ice, adrift in the Arctic Ocean.

Cook was the discoverer of these phenomena of the higher Arctic.

In *My Attainment of the Pole*, Cook notes that at the time he glimpsed Bradley Land to the west of his line of march North, he was himself at a longitude of approximately 95° 36' W; he assumed the mass which he saw to the west was a great distance away, approximately 40 mi, and he thus placed Bradley Land on 102° of Longitude W.

'**As well as I could see, the land seemed an interrupted coast extending parallel to the line of march for about 50 mi, far to the west. It was snow covered, ice-sheeted, desolate.'**[23]

He then deduced the apparent size and elevation of the ice-clad phenomenon based upon its supposed great distance from his own position and concluded that Bradley Land was very large, with an elevation of above 1000 ft, reaching 1800 ft at its highest points. Cook almost certainly saw an ice island but very close to his own position, only a few miles distant, and thus far smaller than he surmised.

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As he continued marching north towards the Pole across the pack, Cook directly encountered an island of old, glacial land ice between 87° and 88° of Latitude N, only 135 mi from the North Pole, surrounded by endless fields of sea ice. He was about 350 mi out from land when he came upon this “glacial ice Island” on 12 and 13 Apr 1908. He travelled over it for portions of these two days and clearly described it. **Dr. Cook was astonished to discover this island of ancient glacial ice so many hundreds of miles from land but it was there and he gave a full account of its physical characteristics. He melted the ice and determined that it was not salty.** He wondered if this island of old glacial land ice might not rest upon a terrestrial island just below sea level; the surface of the ice island itself was at sea level. Thus originated his use of the words ‘submerged island of the Polar Sea’ as a possible explanation for the existence of this glacial ice island so far north in the Arctic Ocean. **Geographer and Polar historian J. Gordon Hays**, **of Cambridge University**, **England**, **in the late 1920s contended that proof of the existence of Cook’s glacial ice island between 87° and 88° N and of the existence of Bradley Land would be confirmation of Cook’s claim to the Discovery of the North Pole. This was also the view of American historical geographer Edwin Swift Balch and of the serious and exhaustive student of the question of the Discovery of the North Pole**, **Captain Thomas Hall**, **an experienced navigator. The rediscovery in modern times of drifting islands of old glacial ice in the region of the higher Arctic through which Cook travelled has confirmed the existence of these phenomena**, **first described by Cook upon his return from the Arctic in September 1909.** And very specifically, the location assigned this island of old, glacial land ice by Cook lies within the drift pattern of at least one ice island and virtually within the drift pattern of another as established in the 1940s and 1950s. Again, Cook was correct concerning a feature of the Arctic Ocean in close proximity to the North Pole, unknown and unsuspected when he left for the Arctic in 1907.

(g) At the North Pole, Cook reported only sea covered by a thick crust of ice in constant movement and upheaval—no land. This is a correct description and was, of course, the first given to the world. He also observed that the prevailing current at the Pole flows from across the

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Pole towards Greenland; he accurately described the Trans-Polar Drift, which was verified by the Papanin Expedition in 1937 and has been confirmed many times since. Cook reported that the drift in the vicinity of the North Pole between 94° and 97° of longitude W is south-easterly. This has been confirmed. He also commented that the drift is stronger at the Pole itself than at 2 or 3° of Latitude south of the Pole between 94° and 97° of Longitude W. Modern exploration has determined that this is correct. This is the effect of the Trans-Polar current.

Further, his assertion that at the North Pole the surface of the pack ice is less uneven and irregular than south of 87° of latitude N, having fewer and generally smaller pressure ridges than below that latitude, being almost smooth and relatively level, and that this condition becomes more marked as one moves north above 87° to the Pole has been corroborated by modern exploration. Wally Herbert in 1969 and Will Steger in 1986, travelling by sledge across the surface of the sea ice, found the pack above 87 ° and at the Pole to be as Cook described it. The surface of the sea ice improves steadily from the 87° N to the North Pole, just as Cook noted in 1908. It is highly improbable if not impossible for this fact to have been deduced from the reports of his predecessors on the Arctic pack to the south. Cook's account of natural conditions at the North Pole, the first announced to the world, accurately pointed out that the pack ice at and near the Pole is less irregular and uneven than to the south. This, of course, permitted higher speeds to be sustained across the pack in that area than would otherwise have been possible. His reported speeds in the vicinity of the North Pole, while extraordinarily good, were nevertheless feasible, averaging about 14 mi a day.

Author's comments: The description above is crucial when considering whether Cook was the first to reach the North Pole. How could he have reported these conditions if he had never been there? Remember, no one else had been there either and conditions were different to what had been expected. Earlier, with regard to Peary we noted that LTC Molett used the same information to explain why Peary's sledding speeds increased as he approached the North Pole. No one had ever anticipated these things prior to Cook going there. Cook's sledding speeds are much slower than those of

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Peary. Until recently, these have never been called into question. Only Robert Bryce, the librarian, has actually tried to claim that Cook's sledding speeds were too fast, but I see no reason to take this claim seriously. Previous experts on the Arctic never considered this to be an issue. Cook was unable to return to Greenland before winter set in and he was forced to spend the winter in Canada unable to reach his food caches. He and his Eskimos nearly perished that winter. Nevertheless, with incredible courage and ingenuity he survived. His attempt on the North Pole had thus taken much longer and been far more dangerous than the conditions encountered by Peary. This makes Cook's assault on the Pole all the more amazing.

(h) On his march north from Cape Svartevoeg to the Pole, between the 94th and 97th Meridians W, Dr. Cook observed that the drift was easterly except in close proximity to the Pole itself where it was, speaking non-technically, south-easterly. (It should also be pointed out that Cook experienced winds usually from the west during his northward march over the pack.) In order to counter the effect of the easterly drift encountered marching north, Dr. Cook decided to return south to Cape Svartevoeg along 100° of Longitude W. As he had expected, the drift was indeed easterly from the Pole as far south as 84° of Latitude. Shortly after reaching this point on May 24, 1908, he became caught unexpectedly in the grip of a strong, south-westerly drift which carried him further and further away from his intended destination and caused him to come ashore on a small island in Hassell Sound, many miles south and west of Cape Svartevoeg. This south-westerly drift began south of 84° of latitude North and at approximately 100° of Longitude W, Cook observed. (By dead reckoning, Cook had determined that he had reached approximately 83° of Latitude N when the effect of this south-westerly drift began.) He noted the great pans of ice thrown up on both sides of the great lead created by this south-westerly drift, extending for miles on each side of it. **At the time Cook reported a strong south-westerly drift in this region of the Arctic Ocean**, **other explorers had not entered this region; this drift was entirely unknown.** However, prevailing drifts north of Greenland and Ellesmere Island reported by Peary in 1905–6 and experienced by Cook himself north of Axel Heiberg Island had been easterly; a south-westerly drift was both unknown and unexpected. **Indeed**, **Cook's original report of**

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a westerly drift in this region of the Arctic Ocean was contrary to the supposition concerning the probable direction of drift in that region prevalent at that time. Cook reported this drift and later exploration and oceanography have confirmed it. The great south-westerly drift south of the 84th degree of Latitude North at approximately 100° of Longitude W is now known as the southeastern segment of the Western Arctic Gyre. Modern exploration and oceanography have verified an absolutely original description of natural conditions in the upper reaches of the Arctic made by Dr. Cook and reported by him to the world in September 1909 and in more detail in his book, *My Attainment of the Pole*, in 1911. Again, Cook was first and Cook was correct.

(i) Cook reported that after finally reaching the southeastern side of the great lead created by the strong south-westerly current and breaking free of its grip, he sledged southeast for days in unbroken fog until the Sun reappeared on 13 June 1908 and he found himself in the Crown Prince Gustaf Sea. His observations on that day showed his position to be 79 degrees 32 minutes Latitude North and 101° 22’ Longitude W on the pack ice of the Arctic Ocean in the Crown Prince Gustav Sea. The drift in that region, he noted was south-south-easterly. This drift has been confirmed in modern times.

The Condition of the Pack at the North Pole

In *My Attainment of the Pole*, Cook reported that beginning south of the Big Lead and continuing north to a point above 87° of Latitude N, the Arctic pack was marked by huge pressure ridges, sometimes of great height, which constituted formidable obstacles to his progress. . .

Pressure ridges north of the 88° and at the Pole are generally smaller than further south and the surface of the pack from 88° of Latitude N to the Pole is less irregular than south of 88°. Cook was correct. Cook could not have surmised this from the reports of his predecessors on the Arctic pack. Nansen, at his furthest north at 86° 14’ N, had climbed the tallest pressure ridge in the vicinity of his camp and reported that, looking north from this point, immense pressure ridges and hummocks stretched away, apparently endlessly, to the north. Above 86° 14’ N, the

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> condition of the pack appeared to Nansen to be exactly as it had been since he had left the ‘Fram’ weeks before and he turned back. CPT Cagni of the Duke of the Abruzzi’s expedition gave the same report from his furthest north at 86° 35’ N; he saw what appeared to be huge towering pressure ridges and hummocks to the north of the point of his furthest advance. Peary reported in 1906 that, looking north from his furthest north at 87 degrees 6 minutes North, the pack was covered with huge pressure ridges and hum-mocks as far as he could see, precisely as it was south of that point.

In another paper entitled *Frederick Albert Cook. The Discovery of the North Pole. The Evidence sustains his First attainment of the North Pole*, Sheldon Cook mentions the following:

> In the years immediately following Dr. Cook’s return from the North Pole in 1909, two thorough and exhaustive studies of Dr. Cook’s North Pole expedition were completed by knowledgeable and painstaking students of Polar exploration, Edwin Swift Balch in *The North Pole and Bradley Land* (1913) and CPT Thomas F. Hall in *Has the North Pole Been Discovered?* (1917). Both Edwin Swift Balch and CPT Thomas F. Hall concluded that the evidence then available clearly supported Dr. Cook’s assertion that he reached the North Pole in April 1908, **that charges and accusations which had been issued and disseminated against Dr. Cook by an organized propaganda were false**, **trivial and irrelevant to Dr. Cook’s claim**, and both students of the subject recognized Cook as the Discoverer of the North Pole subject only to the very proper condition that his first and original descriptions of natural conditions at the North Pole must be verified and confirmed by later exploration at the North Pole and in the region of the High Arctic through which he travelled; if later exploration substantiated and corroborated Dr. Cook’s first descriptions of physical conditions at the Pole, then their recognition of his Discovery of the North Pole would become unqualified. . . [Prof.] Hays reviewed the evidence available during the period of the 1920s and concluded that it was possible that Cook had reached the North Pole in April 1908, that it was probable that Cook journeyed very far north in the Arctic, that the charges which had been uttered and reiterated against his claim were largely irrelevant or

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> ill-based, and that confirmation of his claim to the Discovery of the North Pole must rest with future exploration in the Arctic. . . Prof. Hays' views were embodied in his two books, *Robert Edwin Peary* (1929) and *The Conquest of the North Pole* (1934). Edwin Swift Balch's and Captain Hall's conclusions with regard to Cook's claim were extremely favorable; both, in essence, extended a qualified recognition of Cook's conquest of the North Pole, subject to verification of his original descriptions. Hays' conclusions were also favorable to Cook; he regarded it as possible that Cook had reached the Pole and dismissed as unfounded the alleged negative evidence against his claim. All three students of the question of Cook's discovery of the North Pole asserted that final confirmation of Cook's claim lay with exploration in the Arctic and at the North Pole in the years to come.

As we have seen, Sheldon Cook has mentioned the many instances of confirmation which have since occurred.

ESKIMO TESTIMONY REVISITED

There is one final loose end to tie up with regard to Dr. Cook's attainment of the North Pole, and that is the Eskimo testimony problem.

Prior to contacting the Cook Society I pondered this problem on the basis of what Wally Herbert had written. In his *Noose of Laurels,* Herbert informs us that we really need to take cognizance of the Eskimo testimony against Cook. This tradition of Eskimo testimony against Cook continues to this day.

I was unaware at the time, of the Cook Society's claim that the original Eskimo testimony was actually in Cook's favor and that much documentary evidence to this effect existed. So I studied Herbert's arguments and mulled them over.

By now, the Reader should be well aware of the deeply inter-connected logic used throughout this book, as we study various problems from a multitude of angles. It is essential that the Reader is aware that one conclusion leads to another and so forth. For, in understanding Herbert's arguments, we need to examine clearly the foundations upon which his logic is based. Some of these foundations might not be as solid as one may think at first.

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Herbert says that the Eskimos, to this day, maintain a verbal tradition stating that Dr. Cook and his two Eskimos never reached the North Pole. According to this verbal tradition, they say that Dr. Cook and his two Eskimos went on to the Polar Sea but were never out of sight of land. They then returned to Axel Heiberg and used up their caches of food and went southwards.

I find it hypocritical that Eskimo testimony is not considered good enough to support Peary's claim to have reached the North Pole, and yet, many use it to damn Dr. Cook. Having said that, I think the general consensus among all rational people these days is that Eskimo testimony is indeed good. The Eskimos aren't overly concerned as to which white man reached or did not reach the North Pole. Since they have nothing at stake, there is no motivation on their part to lie. There can be no question that the Eskimo testimony is indeed important. Those who are highly familiar with the Eskimos, like Vilhjalmur Stefansson, explain that the Eskimos "seldom lie." They believe it will bring them bad luck. The real problem however, is in determining exactly what came out of the Eskimo's mouths versus what is attributed to them. There is a problem with regard to the objectivity of the Eskimo testimony since Peary and MacMillan were the main players obtaining it. The Eskimo testimony was given verbally in their language. So our first problem is that this testimony is second hand. Our second problem is that we are dealing with two parties with a deeply vested interest in proving Peary right (i.e. Peary and MacMillan). The Peary/MacMillan version of the Eskimo testimony cannot therefore be accepted purely at face value without supporting evidence. Wally Herbert steps in and informs us that the Eskimos have continued to this day to repeat the same version of the story as told to Peary. This therefore strengthens the Peary argument.

Herbert then goes on to make an interesting statement which on the face of it seems unquestionable. He does not cite the trustworthiness of the Eskimos as being the reason he believes the Peary version of their story. Instead, he points to Cook's photograph of Bradley Land and states that it was definitely used by Cook to "deceive people." Since Bradley Land does not exist, argues Herbert, it therefore follows that the Eskimo testimony is correct. Herbert's logical clincher therefore rests on the existence of Bradley Land. MacMillan also disputed the existence of Bradley Land. And they are right, Bradley Land cannot be found on any map.

This takes Herbert to his next level of argument. Most of the members

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of the Cook Society regard Cook's Bradley Land photograph as that of an "ice island." Herbert is in a prime position to shoot this idea to shreds, and on this point I must agree with him. Herbert states that the photograph of Bradley Land is most definitely not that of an ice island. That photograph represents real land.

What this goes to show, is that Herbert's acceptance of the Peary Eskimo testimony itself rests on deeper thoughts which he believes are physical truths. He is not thus overly convinced by Eskimo testimony alone of Peary's views.

Let us return to the Peary version of the Eskimo testimony. Let me pose you a question. How is it possible for the Eskimos to have been so certain that Dr. Cook never reached the North Pole? How would unschooled Eskimos be able to establish that as a fact? Remember that the North Pole is nothing but ice floating on a Polar sea. There is no special marker, or indication of land or anything which one can see which would indicate that one was at the North Pole. Let us say Dr. Cook and the Eskimos wandered out on to the frozen Polar sea for several days, and they left sight of land. How would these Eskimos know where they were? These Eskimos came from Greenland, and here they were on an unknown sea in a region they had never been to before. How is it possible for them to know their location without any landmarks whatsoever to guide them?

It becomes patently clear that the only man who really knows where they are, is Dr. Cook. For once they lose sight of land, only Dr. Cook would have any idea of their location. He would know this from his navigational calculations and his sextant observations of the Sun. Remember that many have questioned whether Peary knew how to navigate. And others have questioned whether Cook knew how to navigate. Both of them were highly educated men. Peary was a trained engineer, and Cook was a medical doctor. If their credibility as navigators can be called into question, then imagine how much easier it is to question the navigational skills of the Eskimos. Indeed, these unschooled Eskimos, with no knowledge of mathematics and unable to use a sextant, would not have the faintest clue where they were once they left sight of land.

It therefore follows, that if Dr. Cook was hell-bent on deception, that he could easily have accomplished it as follows. All he had to do was march out on to the Polar sea for a few days beyond sight of land, and then declare to his Eskimos that this was the North Pole. The Eskimos would not have

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known any better. The Eskimos would not even know that the Sun circles at the same elevation all day long (depending on the time of year), when you are standing at the North Pole.

Since Cook had already marched all the way from Greenland to Axel Heiberg, and since food caches were nearby, it really does not seem like much to expect Cook to have gone on for just a few days more, just to get beyond sight of land. If Cook was indeed intent on pulling off a great fraud on humanity he could easily have done so. He knew very well that Peary was acquainted with the Eskimos. He would have known that all he had to do was to take the very simple precautions of deceiving the Eskimos and they in turn would have supplied the necessary “eye-witness” accounts in support of him, should Peary, or anyone else enquire.

If deceit was on Dr. Cook’s mind, he could easily have fooled the Eskimos. He supposedly took the trouble of faking photographs of Bradley Land and the North Pole. It would not take much to complete his charade by completely fooling his only two eye-witnesses. If it was so easy, we have to ask ourselves why Dr. Cook did not in fact do this?

Let us consider this in the light of Herbert’s assertions regarding Dr. Cook. Herbert supplies us with recent Eskimo testimony in Appendix I of his book. On page 334 Herbert quotes the Eskimos as stating that Dr. Cook and his two companions were travelling quite happily across the ice with Grant Land (Ellesmere Island) just visible on the horizon. Inexplicably, Dr. Cook decided to go no further. There is no mention of bad weather or food shortages. In short, there is absolutely no rationale for stopping at this point. In fact, according to Herbert, this is the very point made by the Eskimos. They did not understand why they had to stop. Instead, they claim, Dr. Cook sat down and went no further, preferring instead to write constantly for days. The Eskimos became bored and proceeded to build igloos and engage in mock contests of strength to pass the time. Eventually Dr. Cook led them back to land. The implication in the above testimony is that Dr. Cook spent all his time writing so as to fabricate a journey to the North Pole.

Herbert’s version of the Eskimo story lacks any rationale whatsoever for Cook stopping. Cook could easily have gone just that little bit further so as to fool the Eskimos. Instead, he just sat there on the ice making notes and refusing to budge.

We have considered what was needed by Dr. Cook in order to properly fake his attempt on the North Pole. Let us now consider the opposite case.

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Suppose Dr. Cook did indeed reach the North Pole. Is there any misrepresentation of Eskimo testimony which could be used to discredit Cook?

As I mentioned, the Eskimos had no knowledge of mathematics or navigation. Nor did they know the area. Nor had these Eskimos ever been to the North Pole or anywhere near it. The North Pole had no meaning to the Eskimos. The obsession with the North Pole is merely the result of our science. The Eskimos would never have known whether they had reached the North Pole or not. Dr. Cook could have marched them up to a high latitude beyond sight of land and could have stopped anywhere and the Eskimos would not know any better. How could they prove to anyone that they had not reached the North Pole? The simple fact is that the Eskimos could not provide a case against Dr. Cook—except under one condition. Since they had no navigational skills and since they could not read maps, it follows that only a reference to a landmark could give their testimony any meaning. But there is no land in the Polar sea—at least not any that our science currently acknowledges. So the only logical alternative, is to state that they never left sight of land.

Thus, if Peary wanted to manipulate Eskimo testimony against Dr. Cook, he only had one option. He had to claim that they never left sight of land, no matter how illogical that claim should appear. For if he admits that they left sight of land then his Eskimo testimony would collapse and become utterly meaningless. For how could two Eskimos, with no understanding whatsoever of navigation, be able to challenge Dr. Cook’s sextant observations and his navigational calculations?

We have considered how easy it was for Dr. Cook to have hoodwinked the Eskimos on the one hand. We have also considered the only option open to Peary if he wished to try to use Eskimo testimony to discredit Cook. I am struck by the amazing similarity between the Peary version of Eskimo testimony and the only logical option open to him if he wished to discredit Cook. In fact, Herbert’s Appendix containing the Eskimo testimony is even more suspicious. Here was Dr. Cook, in fine weather, with food caches to support him, easily able to go further north to hoodwink the Eskimos, and yet he did not. There was no rational reason for him to stop where he did, if the updated version of the Eskimo testimony is to be believed.

I find it hard to believe that someone such as Dr. Cook, who was riding the crest of a wave of fame, would have been so lazy as to stop at that point.

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He had walked hundreds of miles, and could have completed his charade by walking a few dozen more, yet he chose to stop at that point. It does not make sense. But it does make more sense that this story is itself a fabrication. This story bears the hall-marks of someone who tried to develop a scenario whereby the false testimony of two uneducated Eskimos could be used to counter the superior navigational skills of an experienced and educated man.

As I mulled this story over, I became very suspicious of it, so I sent the gist of my thoughts to the Cook Society and asked them if they had anything to say about the Eskimo testimony. Prof. Ralph Myerson, the Vice-President of the Cook Society replied in an e-mail dated 26 June 1998 as follows:

> Your thoughts on Cook's trip to the pole are right on and coincide with ours. **In fact**, **we have definitive evidence that the first Eskimo testimony confirmed Dr. Cook's story. It was only later when**, **perhaps to mollify Peary and under pressure**, **that their story changed.** We have a lot of data on that which we will send on. . .
>
> Sheldon Cook sent me a paper entitled: *The First Testimony of the Polar Eskimos, April–August 1909*. Kindly note that the Eskimos refer to the North Pole as the Great Nail. Here are several excerpts from his paper detailing the events surrounding the Eskimo testimony.
>
> "The first Eskimo testimony regarding Cook's Arctic travels in 1908–9 confirmed Cook's account of his march to the North Pole across the drifting pack ice of the Arctic Ocean in March and April 1908, accompanied by two Eskimo companions, his arrival there in April 1908, his long and difficult return south over the ice-covered Polar Sea to land, the Winter of 1908–9 at Cape Sparbo, Devon Island, and the painful, final journey from Cape Sparbo to Cook's base camp at Annoatok in northwestern Greenland, arriving there in the middle of April 1909, fourteen months after his departure bound for the North Pole. **The original account given by the Polar Eskimos to Knud Rasmussen**, **Danish explorer and anthropologist**, **in the Summer of 1909**, **corroborated Cook's assertion that he marched north across the pack ice of the Arctic Ocean for weeks in March and April 1908 and reached the North Pole on 21 Apr 1908**, **becoming thereby its discoverer. The Polar Eskimos whom Rasmussen interviewed at**

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Cape York in the Summer of 1909, months after Cook had sledged south to southern Greenland and shortly before Peary's return from his last foray on the Arctic pack, stated that Etukishook and Ahwelah, Cook's Eskimo companions, had told them of Cook's great sledge march north across the pack from Cape Svartevoeg to the Great Nail, and they gave important details of the journey. The Eskimos recounted to Rasmussen that Cook had travelled so far to the North from land across the pack ice of the Polar Sea before arriving at his goal that Etukishook and Ahwelah had feared that they would never return to land and their homes. Etukishook and Ahwelah, they said, had asked Cook several times to return to land as they sledged north over the pack because they felt that they had gone such a great distance from land that they would be unable to reach it again, but Cook had refused until the Great Nail had been attained. **The Polar Inuit pointed out in their spontaneous and forthright account that Etukishook and Ahwelah had told them that far north on the pack ice of the Arctic Ocean, far from land, the surface of the sea ice improved and that it became steadily better all the way to the Great Nail. The Eskimos told Rasmussen that during the march north when Cook had determined with his sextant, or 'sun glass' as they called it, that he was only one day's march south of the Pole, he had danced on the ice with exultation and glee.** They also related to Rasmussen that when Cook had ascertained the next day that he had reached the North Pole, Ahwelah and Etukishook were astonished and disappointed to find that there was nothing at this ultimate point towards which they had striven for weeks but ice. The Polar Eskimos also described Cook's return journey south in considerable detail, the difficult march across the pack to land, which was reached just before the arrival of Summer, the wintering at Cape Sparbo on Devon Island and the painful struggle back to Annoatok which was attained in April of 1909. The account of Cook's historic sledge march of 1908–9 given by the Polar Eskimos to Rasmussen in the Summer of 1909 entirely conformed to and substantiated the narrative of his journey to the North Pole and the return to Annoatok given by Cook himself independently to Rasmussen and other Danes hundreds of miles away in southern Greenland. Rasmussen was convinced that Cook's claim to the attainment of the Pole had been confirmed by the Eskimo account; he

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was so impressed that he took down the testimony which he had elicited from the Polar Eskimos in writing and it was published in English in the *New York Times* on 21 Oct 1909. It is also reproduced in *The Case for Dr. Cook*, by Andrew A. Freeman, published in 1961.

A party of Danes who had been sent by the Danish government was in northwestern Greenland in the Summer of 1909 at the time Rasmussen was interrogating the Polar Eskimos concerning Cook's Polar journey of 1908–9. Among the Danes were Captain Henning Schoubye, master of the ship, 'Godthaab,' which had brought the party north, and Professor Hans P. Steensby, a distinguished anthropologist, who was a student of the Eskimos and their culture. Other Danes were also present. **Schoubye and Steensby heard Rasmussen interview many, many Eskimos—Schoubye said more than 35 and Steensby, more than 40. All of these Eskimos said that Etukishook and Ahwelah had told them of Cook's long march across the moving pack to the North Pole and they gave the same report of the long journey south to land, then to Sparbo and, after wintering there, to Annoatok. Professor Steensby is even reported to have said that the Polar Eskimos stated that Etukishook and Ahwelah had told them that the Sun circled the horizon the entire time that they were at the Great Nail with Cook and that it neither rose nor set in the least! This condition can only exist at one of the Poles of the Earth and the Eskimos had never witnessed it before that moment. It is almost impossible that they could have described this phenomenon without having seen it because it would never have occurred to them**. . . There can be no question that both Steensby and Schoubye heard the Eskimos interrogated by Rasmussen and they both reported that the Eskimos confirmed Cook's long march to the Pole and corroborated his account. . .

The Stolbergde Quervain Expedition which was sponsored by the Berlin Geographical Society was also in northwestern Greenland during the summer of 1909, long after Cook's departure for South Greenland in April and before Peary's return to northwestern Greenland from his northern foray in mid-August 1909. **The members of this expedition were also told by the Polar Eskimos of Cook's conquest of the North**

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Pole. They received the information that Cook had reached the North Pole from a Polar Eskimo at the Sermittlet Fjord in northwestern Greenland during the Summer of 1909 and their report was published in the *New York Herald* of 16 Sept 1909.

. . . Harry Whitney had secured passage to northwestern Greenland as a paying passenger aboard Peary's auxiliary ship, 'Erik,' in the Summer of 1908. He had come ashore at Etah and shortly thereafter had moved into Cook's hut at Annoatok, Cook having departed on his North Pole journey on 19 Feb 1908 and not having by that time returned. Whitney was living in Cook's hut when Cook returned with his Eskimo companions, Etukishook and Ahwelah, on 15 Apr 1909. **Cook told Whitney and Pritchard**, **cabin boy on the 'Roosevelt**,**' who was also living in Cook's quarters**, **that he had reached the North Pole on 21 Apr 1908**, **but asked that they keep the information strictly in confidence so that he might give the news himself when he reached civilization.** He authorized them to tell Peary and his associates when they returned from their northern march that he had journeyed far north across the pack and had established a new 'furthest north' record, which was true, but asked that they not mention to Peary or his men specifically that he had reached the North Pole. **Cook had made the same request of Ahwelah and Etukishook**, **his two Eskimo companions. They were**, **of course**, **not bound by Cook not to divulge his attainment of the North Pole to their kinsmen and fellow tribesmen of the tribe of Polar Eskimo. His Eskimo companions were left free to reveal the full extent of his Polar journey to the other Inuit**, **several of whom had accompanied Cook**, **Ahwelah and Etukishook a part of the distance to the Great Nail**, **and they did so upon their return to Annoatok with Cook in April 1909.** Etukishook and Ahwelah were pledged by Cook to convey to Peary and his party only the information that Cook had sledged far, far north over the pack ice of the Arctic Ocean. . . On 20 Apr 1909, Cook left Annoatok and began his epochal 700 mile sledge and boat journey to Upernavik in Danish Greenland where he planned to return to the United States. Cook reached Upernavik on 21 May 1909; from the time he crossed Melville Bay and entered Danish Greenland, Cook was wholly out of touch with the Polar Eskimos and no direct communication with them was ever

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"Whitney was impressed by Etukishook and Ahwelah,Cook's Eskimo companions on the Polar march, and hunted with them during the Spring and Summer of 1909. **He was thus in a peculiarly favorable position to learn directly from them where they had in fact gone with Cook during the period between 19 Feb 1908**. . . **and 15 Apr 1909** when he had returned to Annoatok. Whitney also heard at this time the testimony of other Eskimos of the tribe who had themselves talked with Etukishook and Ahwelah and had learned from them of their long march to the North Pole with Cook in 1908 and of the circuitous and difficult return journey in 1908–9. **During the period between 20 Apr 1909 when Cook left for South Greenland**, **and 17 Aug 1909**, **when Peary returned to Etah from his last march on the Arctic pack**, **Knud Rasmussen**, **Captain Schoubye**, **Professor Steensby**, **and the members of the Stolbergde Quervain Expedition of the Berlin Geographical Society had all heard from the Polar Eskimos that Cook had reached the North Pole with Etukishook and Ahwelah**, **and the full and detailed account given by the Eskimos to Rasmussen**, **Schoubye**, **and Steensby of Cook's journey to the Pole and the return to Annoatok conformed to the lengthy narrative of the expedition given by Cook himself to Rasmussen and other Danes hundreds of miles away in South Greenland. Whitney's own conversations with Etukishook and Ahwelah and the other Eskimos concerning Cook's travels in 1908–9 took place at this time. In an interview given to the *New York Herald* and published in that newspaper on 27 Sept 1909**, **Harry Whitney said: 'I have no doubt that Dr. Cook found the Pole. I believe this not alone from what he told me but also from what I could get with my knowledge of their language from his boys .' Whitney confirmed Ahwelah's and Etuskishook's corroboration of Cook's account**. . . **in a number of interviews with the press in late September and early October 1909 and Whitney's statement recounting the supporting testimony of Cook's Inuit companions was published in numerous other newspapers at that time**.

Whitney was also present in Annoatok and nearby Etah when Peary

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> returned from Cape Sheridan on 17 Aug 1909 and cross-examined Ahwelah and Etukishook and other Eskimos in an attempt to learn where Cook had gone in 1908–9—his 'furthest north.' After being interrogated by Peary and his colleagues, Borup being the primary interlocutor, **Etukishook and Ahwelah had come to Whitney and asked him what purpose Peary's men had in questioning them; what were they attempting 'to get them to say?' They stated to Whitney that they were shown papers and maps but that they did not understand these papers. The Eskimos were fully aware of Peary's hostility to Cook from the events of the Summer of 1908 and, further, were inspired by a healthy fear of Peary after years of domination by him**.

Author's comments: Whitney's first-hand account as a neutral third party is of great significance. Here we have his testimony that Peary tried to influence their testimony. Just as important is the comment that the Eskimos could not even read a map.

> On 20 Aug 1909, shortly after the interrogation of the Eskimos at Etah by Peary and his associates was completed, Peary left aboard the 'Roosevelt' bound for Labrador and thence to the United States. Whitney boarded the 'Roosevelt' and headed south down Smith Sound with Peary and his party. **(At Etah, just before departing, Peary had compelled Whitney to remove from the 'Roosevelt' that part of his baggage which contained the portion of Cook's original records and his sextant which Cook, at Whitney's invitation, had entrusted to Whitney's care and which Whitney had undertaken to return to Cook in the United States in late September or October 1909; Whitney and Captain Robert Bartlett had deposited these effects of Cook packed in a box near the shore at Etah.)** At North Star Bay, Whitney's chartered ship, the 'Jeanie,' appeared on 23 Aug 1909 bound for Etah at the very end of the season to embark Whitney for his voyage out of Greenland waters and thence home. . . Later, Whitney reported that during the time he was on the 'Roosevelt' after its departure from Etah, neither Peary nor any other member of Peary's expedition mentioned to him that Cook's Eskimos had denied that Cook had reached the Pole in April of 1908, or, indeed, that they had in any way

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changed their earlier testimony.

On 13 Oct 1909, the Peary Arctic Club released a statement signed by Peary, MacMillan, Bartlett, Henson, Borup and other members of Peary's expedition, but not including the signature of Dr. John W. Goodsell, surgeon of Peary's expedition, which alleged that Cook's Eskimos, Etukishook and Ahwelah, and other Polar Eskimos had denied during the interrogation at Etah that Cook had reached the North Pole and asserted that they had testified before Peary and his associates that Cook had travelled only a short distance north of Cape Svartevoeg, then had turned west, then south and had sledged south along the western coast of Axel Heiberg Island, thence to the eastern coast of Amund Ringnes Island, south along its coast, and finally to Devon Island during the Spring and Summer of 1908, then had marched south to Devon Island, thence east along Jones Sound to Cape Sparbo, had wintered at Sparbo and returned north to Annoatok in April 1909; **according to this statement signed by Peary and certain members of his expedition**, **Cook's Eskimos said that Cook was never out of sight of land. This Peary version of the Eskimo testimony concerning Cook's Arctic journey 1908–9 was promulgated by the Peary Arctic Club with great fanfare and was published in the *New York Times* on 13 Oct 1909 and all other leading newspapers immediately thereafter**.

Whitney, who had himself heard directly from Cook's Eskimo companions and from other Polar Eskimos as well that Cook in fact had reached the Pole in April 1908, became familiar with this Peary version of the Eskimo testimony after its publication in the United States. **Harry Whitney never endorsed this Peary version of the Eskimo testimony and the words which he uttered and the behavior which he manifested always indicated his strong belief that Cook had indeed reached the North Pole in 1908.** The 1913 edition of Cook's Book, *My Attainment of the Pole*, contains a prefatory section entitled, *The Present Status of the Polar Controversy* which declares that the evidence, after careful examination, supports Cook's claim to have reached the North Pole on 21 Apr 1908, and calls for full official recognition of Frederick Albert Cook as the Discoverer of the North Pole. Among the many distinguished explorers and Arctic authorities listed in this prefatory

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section as supporters of Cook's claim to the first attainment of the North Pole and advocates of his unqualified recognition as Discoverer of the North Pole is Harry Whitney. **Unless Whitney had heard directly from Etukishook and Ahwelah and other Polar Eskimos full corroboration and confirmation that Cook had reached the North Pole in April 1908, it would have been impossible for him to take this position. He was an independent, impartial, and objective witness of events in northwestern Greenland between August 1908 and August 1909; he belonged to neither the Peary nor the Cook expedition and had absolutely no reason to speak or act in a false or misleading manner regarding Cook's achievement. Taking into account all that he knew, the Eskimo testimony which he had heard, and the statements which he made in support of Cook, it must be concluded that Whitney should have spoken out even more forcefully than he did, but, nevertheless, despite the pressures brought to bear, he always supported the reality of Cook's achievement when he spoke**. . .

Jens Daugaard–Jensen, Inspector of North Greenland, leader of the Danish party which had visited North Greenland in the Summer of 1909, after being fully informed of the testimony of the Polar Eskimos concerning Cook's conquest of the North Pole, sent the following official cable to the Danish government from Lerwick, in the Shetland Islands on 1 Sept 1909: "Dr. Cook reached the North Pole 21 Apr 1908. Arrived May 1909 at Upernavik from Cape York. The Cape Yorkers (Eskimos) confirm to Knud Rasmussen the voyage of Cook."

The questioners knew and understood the language of the North Greenland Eskimos. Knud Rasmussen, the Dane who interrogated the Polar Eskimos very extensively in July and August of 1909 concerning Cook's Arctic travels in 1908–9, was partially of Eskimo ancestry and was extremely proficient in the Eskimo tongue, both the North Greenland and the South Greenland dialects. He thoroughly understood the language of the Polar Eskimos and, indeed, was fluent in it. Thus, he was able to put his questions in language fully understood by the Eskimos and he similarly was able to comprehend clearly their answers and comments regarding Cook's journey. His interrogations were

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extensive and exhaustive. CPT Schoubye and Prof. Steensby themselves heard him carefully question at least 35 or 40 Eskimos regarding Cook's whereabouts in 1908–9. The information given Rasmussen by the Eskimos was always the same: Cook, with Etukishook and Ahwelah, had travelled far north over the Arctic pack to the North Pole in 1908 and had then returned south, had reached land again after many weeks on the Arctic pack, just before the beginning of summer, and had then been compelled by the condition of the pack to travel to Devon Island, winter at Camp Sparbo, and return to Annoatok in April 1909.

CPT Schoubye understood the language of the Eskimos of northwestern Greenland, though. He certainly did not possess the proficiency of Rasmussen in their speech. He had made a number of voyages to northwestern Greenland as captain of the Danish ship 'Godthaab' and was able to communicate with the Eskimos of this region. He journeyed to Inglefeld Gulf and interviewed the Eskimos there himself concerning Cook's great journey of 1908–9. The testimony of the Eskimos there unanimously confirmed and was entirely in agreement with the testimony elicited by Rasmussen that Cook had sledged far, far to the north with Etukishook and Ahwelah, had reached the North Pole, and had then returned south, wintering at Cape Sparbo, arriving in Annoatok in April 1909.

Prof. Steensby was a distinguished Danish anthropologist who had made the Eskimos and their culture his special study. He witnessed Rasmussen's interrogations of at least 40 Polar Eskimos, heard their responses and comments concerning Cook's historic expedition of 1908–9 and later stated that they corroborated Cook's own account of his journey to the Great Nail. . .

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Whitney apparently had no knowledge of the Eskimo language when he arrived in Annoatok in July 1908, **but he quickly learned it because it was necessary for him to employ it in his daily life among the Eskimos at Annoatok and Etah. By the summer of 1909 he had a good, practical working knowledge of the tongue. He went on hunting expeditions with Etukishook and Ahwelah during the summer of 1909, after Cook's departure for South Greenland in April of that year. That he had acquired considerable knowledge of the North Greenland dialect by the Summer of 1909 is clear from the fact that after Peary's interrogation of Etukishook and Ahwelah on 17 Aug 1909, it was to Whitney that they came, asking what Peary's men wanted them to say and stating that they did not understand the papers and maps which they had been shown**. . .

As quoted above, Sheldon Cook informs us that Knud Rasmussen's original interviews resulted in Eskimo testimony which was favorable to Dr. Cook. Rasmussen later tried to retract this original testimony which he had published. Sheldon continues:

Knud Rasmussen in July 1909 had interrogated at least 35 or 40 Polar Eskimos and had heard from them all without exception that Ahwelah and Etukishook had told them of Cook's journey to the Great Nail and they had related it in great detail as discussed hereinabove. **Rasmussen was so impressed with the certainty and the unanimity of their report of Cook's success, and the fact that their account conformed to Cook's own narrative given to him independently that he transcribed their testimony and it was published in English in the *New York Times* on 21 Oct 1909 and in Danish in the Copenhagen newspaper, *Politiken*. The first Eskimo testimony according to Rasmussen obviously corroborated Cook's claim to the discovery of the North Pole.** After his own interrogation of the Polar Eskimos, Rasmussen asked a Danish missionary in northwest Greenland to question Etukishook and Ahwelah concerning their journey with Cook in 1908–9 and to send him the information received from them. **Rasmussen issued a second report in 1910 in which he asserted that the two Eskimos had denied to the missionary the correctness of the**

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earlier account and had asserted that Cook did not go to the Great Nail. Rasmussen thus attempted to retract the first testimony given by the Polar Eskimos. But the original testimony of the Polar Eskimos which told in great detail of Cook's march to the Pole is not logically susceptible to retraction. The account of the journey of Etukishook and Ahwelah with Cook is lengthy, relatively complex, and narrates events and conditions which can only have been recited because experienced and witnessed by Etukishook and Ahwelah; their account is by its very nature a recital of actual events because Etukishook and Ahwelah could only have known of them had they actually occurred and the other members of the tribe could only have related to Rasmussen, and to Schoubye and Steensby, what they had actually heard from Ahwelah and Etukishook because it is just as impossible, or unlikely in the extreme, that they could have or would have conceived or invented the long and involved narrative which they gave. The first Eskimo testimony confirming Cook's march to the North Pole with his two Eskimo companions is logically explicable only as a recital of actual events. . .

How then is Rasmussen's attempt to retract this original testimony to be explained? **The anti-Cook propaganda barrage had been in full operation since 8 Sept**, **1909 and**, **after months of charges constantly reiterated**, **was beginning to have an effect. By December of 1909**, **it may well have been that Rasmussen felt it wise to extricate himself from a very difficult position—he had been a primary defender of a man who was now under serious attack**, **continuously and unabatedly**, **and it must have appeared to many by the end of 1909 that Cook had been condemned by his own country**, **which was not in fact true**, **but in Denmark it might have appeared**, **erroneously**, **to be the case.** It should be pointed out that, according to Cook, the Danish missionary who undertook to question Ahwelah and Etukishook was not even familiar with the North Greenland dialect and thus could not really have communicated with nor properly understood the two Eskimos. Rasmussen, of course, was partially of Eskimo ancestry and was proficient in the North Greenland dialect and he himself conducted the interrogations in 1909 which confirmed Cook's own account.

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Sheldon Cook also points out the dichotomy between Dr. Cook's observations at the North Pole and those of Peary:

> Dr. Cook's message by cable to the *New York Herald* preceded by 5 days Peary's announcement to the press from Labrador that he had himself reached the North Pole on 6 Apr 1909, a date almost a year to the day after Cook's attainment of the Pole. **Cook's first skeletal account**, **his North Pole Diary**, **and his book are replete with details of natural conditions at the North Pole. Peary's later account gives little information concerning this all-important subject**.

RENEWED SUPPORT FOR COOK

In Sheldon Cook's paper: *Frederick Albert Cook. Discoverer of the North Pole. 21 Apr 1908. A Statement of the Evidence*. He tells us of Cook's recent supporters:

> The 1993 Symposium at the Byrd Polar Research Center of The Ohio State University, 'Cook Reconsidered: Discovering the Man and His Explorations,' was a great victory for Dr. Cook. Explorers, historians, ethnologists, navigators and students of the history of Polar exploration from the USA, UK, France, Russia, Canada, and Denmark presented papers concerning Dr. Cook's Discovery of the North Pole, his magnificent work in the Antarctic with the Belgian Expedition of 1897–9, his pioneer ethnological endeavors among the Polar Eskimos, his accomplishments in Polar medicine and his understanding of Polar conditions.
>
> Brian Shoemaker, retired CPT in the US Navy, navigator, veteran of years of service in both the Arctic and the Antarctic, had carefully studied Cook's route across the pack ice of the Arctic Ocean from Cape Svartevoeg, Axel Heiberg Island, north to the Pole and the route of his return south from the Pole over the drifting pack to his landfall on a small island in Hassell Sound. Shoemaker determined that Cook's sledge route north across the Arctic Ocean to the North Pole and his return route south over the moving pack ice to land as delineated and described by Dr. Cook in his North Pole Diary, field papers and in his

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book, *My Attainment of the Pole*, conform to the currents of the Arctic Ocean in the region through which Cook sledged. These currents, their location and the direction and force of their flow, were unknown when Cook departed the United States for the Arctic in 1907 and **were not established by modern exploration and oceanography and shown to exist until decades after Cook's historic journey to the North Pole and his return to land in 1908.** Cook correctly described the currents and patterns of drift in the region of the Arctic Ocean through which he sledged to and returning from the North Pole long before these currents and patterns of drift had been reached by later expeditions and their existence and character verified and his route to and from the North Pole conforms to these currents. And Cook's accomplished distances per day along his route and the time required to achieve them conform to and are consistent with the currents and other natural conditions as they are now known to exist in the region of the Arctic Ocean through which Cook ventured. . .

Joseph O. Fletcher, retired Colonel in the USAF, commander of the first party to establish a station on a glacial ice island of the Arctic Ocean after the rediscovery of the ice islands by the United States Air Force in the late 1940s and early 1950s, a leading student of the Arctic for almost 50 years and an official of the NOAA, gave an interesting presentation describing physical conditions in the High Arctic, conditions which would have been encountered and surmounted by Dr. Cook in his march across the pack ice of the Arctic Ocean north from Cape Svartevoeg to the Pole. In Colloquy during a question and answer session following the advocacy and defense of Dr. Cook's claim to the Discovery of the North Pole by the Historian of The Frederick A. Cook Society, **COL Fletcher told the Symposium that the evidence overwhelmingly supported Cook's assertion that he reached the North Pole in April 1908 and that he agreed with the summary of the supporting evidence and the conclusion that Cook was the Discoverer of the North Pole** set forth in the presentation by the Society Historian entitled *Frederick Albert Cook: The Discoverer as Defendant in the Court of Historical Inquiry.*

Vladislav S. Koryakin, glaciologist and Polar historian of the Institute of

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Geography of the Russian Academy of Sciences in Moscow, sent a paper to the Symposium which is an integral part of the formal proceedings of the Symposium.

Koryakin has thoroughly studied Cook's North Pole Expedition for more than 20 years and has contended since 1975 that Cook was the Discoverer of the North Pole. Koryakin again stated clearly, firmly and unreservedly his conclusion, reached after years of careful study, that the evidence supports Dr. Cook's assertion that he reached the North Pole on 21 Apr 1908. . .

Jean Malaurie, Director of the French Center for Arctic Studies and one of the most outstanding figures in Arctic exploration and the study of the Arctic in the last half century spoke very favorably of the possibility, even perhaps the probability, that Frederick Albert Cook reached the North Pole in April 1908 and was its Discoverer. **He indicated very clearly that the evidence which supports Cook's claim to the Discovery of the North Pole has now become very strong and most compelling. His pro-Cook position at the Symposium in October 1993 was even stronger than that set forth in the chapter on Cook in his book *Ultima Thule*, published in 1992.**

All of the presentations at the Symposium were favorable to Dr. Cook except that by Dennis Rawlins, who alone adhered to the old anti-Cook case, contending that his claim was false, that his nautical observations contain fatal errors and are fraudulent.

In his oral remarks to the Symposium, Wally Herbert, the distinguished British explorer of the Arctic and the Antarctic, the greatest living Polar explorer, gave a favorable assessment of Dr. Cook's outstanding work in the exploration of the High Arctic. Wally Herbert did not refer specifically to Cook's claim to the Discovery of the North Pole. But he praised Cook's courage, his achievements in the exploration of the Polar Regions and his stature as a great Polar explorer, stressing that both Cook and Peary are entitled to magnificent tribute for their courage, fortitude, and accomplishments in the Arctic whether or not either reached the pinpoint of the Pole itself.

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Kenn Harper, a Canadian who has lived among and studied the Eskimos of Canada and northwestern Greenland for many years and is a dedicated student of Arctic history, delivered a paper which was very favorable to Dr. Cook, whose ethnological work among the Polar Eskimos he had examined and whose reputation among the Eskimos themselves he knew.

Rolf Gilberg, a Danish ethnologist who has studied the Polar Eskimos of northern Greenland for many years and is a specialist in the study of the Greenland Eskimos and a curator of the Danish National Museum in Copenhagen, delivered a most interesting paper on Dr. Cook's pioneer ethnological studies of the Polar Eskimos of northwestern Greenland during the period 1891–1909. He found Cook's work of the highest quality and of very great value to anthropology and to history. Although he did not touch directly upon the North Pole matter, the respect and high regard he has for Dr. Cook was clear and obvious from the tone of his presentation.

Ted Heckathorn, Polar historian and student of Polar exploration for more than thirty years, **pointed forcefully to the very important fact that there is no credible negative evidence against Cook's claim to the Discovery of the North Pole. There is, he explained, a very substantial body of significant and compelling evidence that Cook reached the North Pole and no significant evidence that he did not. The case against Dr. Cook, he said, was fabricated by Peary and his cohorts in order to render it possible for Peary to claim the distinction of being the Discoverer of the North Pole. And the charges against Cook of alleged fraud in his claim to the first ascent of Mt. McKinley in 1906 were wholly designed by Peary to convince the public and the community of scholars that Cook's claim to the Discovery of the North Pole was false because he and his adherents contended Cook's McKinley claim was fraudulent. Heckathorn stressed that the evidence strongly supports Cook's claim to the Discovery of the North Pole while a careful examination of the charges against Cook by the Peary forces regarding his claimed ascent of Mt. McKinley reveals that Cook's claim to have reached the summit of Mount McKinley in 1906 has never been disproved,**

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despite assertions to the contrary, **that there is considerable evidence to support his claim and a great deal of evidence demonstrating that the accusations against Cook with regard to his ascent of Mt. McKinley were fabricated and orchestrated by Peary and his apparatus**, **primarily for the purpose of undermining Cook's perfectly legitimate claim to the Discovery of the North Pole**.

Dr. Ralph M. Myerson, physician, Professor of Medicine in the Medical College of the University of Pennsylvania, student of Polar history and Vice-President of The Frederick A. Cook Society, gave the Symposium a full and informed account of Dr. Cook's service in the Antarctic with the Belgian Antarctic Expedition, his magnificent performance as explorer and physician in the South Polar wastes. Myerson, learned in both medicine and Polar history, was peculiarly well-fitted to analyze and evaluate Cook's abilities as a physician and scientist and as an explorer. Cook's correct, first diagnosis of the cause of severe depression and melancholia in the Polar Regions as being the absence of light and heat in the long Winter nights, the months without the warmth and light of the Sun, and his original, innovative and effective treatment of the condition by exposure to the light and heat of fire in a ship's stove were extraordinary contributions to the survival of the expedition and to the accomplishment of its mission.

In another paper, Sheldon Cook mentions that Russians count among those who currently support Dr. Cook:

A. F. Treshnikov, Director of the Arctic and Antarctic Institute of St. Petersburg, Russia, explorer and Polar historian, studied the question for many years, examining carefully all the evidence. He concluded that Dr. Cook certainly reached the vicinity of the North Pole, at least, **that his correct descriptions of Polar phenomena not rediscovered for decades after his great sledge journey makes this fact clear. Cook knew far too much about conditions in the North Polar basin**, **which he described in his diary and his book**, **not to have been there. Treshnikov decided that Dr. Cook must have been there. The conditions which Cook described were wholly unknown in 1908**, **were not verified for many**, **many years by later exploration**, **and**

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could not have been deduced from information which existed in 1908.

In 1973, Treshnikov cabled Helene Cook Vetter, Dr. Cook's daughter, his congratulations for her father's magnificent achievement, one of the greatest in the history of exploration and discovery. Dr. Treshnikov's congratulatory message is deposited with the Dr. Frederick A. Cook Papers at the Manuscript Division of the Library of Congress in Washington, D.C.

The distinguished glaciologist and Polar historian , Vladislav S. Koryakin , Academician of the Russian Academy of Sciences in Moscow, studied the evidence relating to Dr. Cook's North Pole Expedition for a period of some years in great depth and concluded in 1975 in a paper, entitled *Was Cook at the North Pole?* published in *Priroda*, a Russian scientific journal, that Dr. Cook almost certainly reached the North Pole in April 1908 and was its discoverer. He cited the verification of Cook's first and original descriptions of natural phenomena at the North Pole and in the North Polar Region. Koryakin continued his exhaustive study of the evidence, including the most recent data from modern exploration in the Arctic regarding physical conditions at the North Pole, the nature and condition of the sea ice, the direction and force of the ocean current at the North Pole and throughout the North Polar Region, glacial land ice islands adrift in the Polar Sea and other natural phenomena. **He found that recent data confirmed Cook's first descriptions. Koryakin translated Cook's narrative of his North Pole Expedition**, ***My Attainment of the Pole***, **into Russian and it was published in Russia in 1987. In his Introduction to Cook's book**, **Koryakin recognized him as the Discoverer of the North Pole**.

Rear Admiral Charles W. Thomas of the United States Coast Guard, veteran navigator of the Polar Seas of the Arctic and the Antarctic and a student of glaciology and oceanography, who was familiarly known as the 'Ice Admiral', concluded on the basis of all the evidence that Dr. Cook reached the North Pole in April 1908 and was its discoverer. Admiral Thomas served as President of the Dr. Frederick A. Cook Society from 1956 until his death in 1972

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> Many books have been written in recent decades restating the case for Dr. Cook. Sheldon Cook names them as:
>
> The following works all set forth conclusions favorable to Dr. Cook's discovery of the North Pole: *The Case For Dr. Cook* by Andrew R. Freeman (1961); *The Polar Passion, the Quest for the North Pole*, by Farley Mowat (1968); *The Big Nail*, by Theon Wright (1970); *Winner Lose All, Dr. Cook and the Theft of the North Pole*, by Hugh Eames (1973); Frederick J. Pohl, historian of exploration, in his Introduction to Dr. Cook's posthumous book, *Return From the Pole* (1951); *Hero in Disgrace*, by Howard S. Abramson (1991).

Let us return to the question of the Peary/MacMillan Eskimo testimony. Many aspects of it are suspicious. One of the problems with lying is that lies lack consistency. Lies normally have to be amended because of truths which surface after the fact and which are then at variance with the original lie. Peary's Eskimo testimony suffers from this problem. Peary's papers were sealed for several decades and were only opened in recent years. Those who have studied the transcripts of what the Eskimos purportedly said have noticed suspicious changes as various statements had been crossed out and replaced with new words–as if the original interrogators had been amending the story. Even opponents of Cook are at odds in deciding which version of the Peary/MacMillan Eskimo testimony they believe. Ted Heckathorn of the Cook Society made these observations:

> The only major issue concerning Dr. Cook's 1907–9 Arctic expedition relates to his 1908 journey on the Arctic Ocean from March to June. Peary and his followers all contended that Cook went north no farther than three days from what is now known as Cape Stallworthy. **MacMillan has furnished conflicting statements at different times. His final contention was that Cook traveled less than 14 mi north of the cape. Peary and MacMillan's interview with the Inuit differed materially from what they reported to the media in 1909.**
>
> Considering this recently discovered Inuit testimony and other evidence, both Bryce and Osczevski now believe that Cook went a much greater distance, perhaps 90 mi or more on the Arctic Ocean before returning to land.[24]

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As can be seen from the above, MacMillan issued conflicting statements regarding the Eskimo testimony. There are also differences between the Eskimo testimony as reported in the newspapers of the time and the actual records which have remained sealed for so long. If one looks carefully at the Peary/MacMillan version of the Eskimo testimony it clearly bears the hallmarks of a fabrication intended purely to discredit Dr. Cook. Even Bryce and other opponents of Cook no longer accept Peary and MacMillan's statements at face value. That version of the story, still peddled by Wally Herbert, does not make any sense.

Sheldon Cook may however have found the clincher which cannot be ignored. It comes directly from MacMillan's camp:

> Among the members of MacMillan's expedition, which had a pro-Peary purpose, was Edwin S. Brooke, Jr., who was photographer of the expedition. MacMillan found in 1914 that Crocker Land does not exist.
>
> While the MacMillan Crocker Land Expedition was in northwestern Greenland in 1913, **Brooke had the opportunity to question Etukishook and Ahwelah concerning their Arctic travels with Cook in 1908–9. Cook's two Eskimo companions told Brooke that they had travelled far north across the pack and far**, **far from land with Cook**, **so far from land that it was late summer before they had returned across the pack and were able to make permanent camp again on land. This testimony of Ahwelah and Etukishook**, **adduced four years after the inquisition at Etah**, **directly contradicts the report of their testimony announced by Peary from Battle Harbor**, Labrador on 8 Sept 1909 and set forth in the Report of the Peary Arctic Club published in the *New York Times* on 13 Oct 1913.

That final testimony, from the two Eskimos concerned, elicited by a neutral person, should indeed settle the matter for once and for all. This testimony was obtained long after Peary and MacMillan had issued their twisted and propagandized version. This final testimony matches the first and original Eskimo testimony which was also in support of Dr. Cook.

BRADLEY LAND

After that long but necessary digression, let us now return to the

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question of Bradley Land. I was fascinated by the proximity of Bradley Land to Crocker Land. That three different teams of explorers (led by Peary, Cook and MacMillan) should report land in virtually the same region seems to defy coincidence. Ever since I looked at Wally Herbert's book *Noose of Laurels,* I wondered if there was a connection between Crocker Land and Bradley Land. Initially, I wondered if Bradley Land was an outlying island not far from the continental land mass of Crocker Land. I have also wondered if Bradley Land and Crocker Land might perhaps be one and the same. This later thought is somewhat of a stretch, but it is a possibility I cannot rule out altogether.

One of the problems with the passionate Cook/Peary debate is that there is no middle-ground left. This makes a rational discussion of the Crocker Land and Bradley Land controversies virtually impossible. The Peary supporters will not even begin to consider the possibility of either Crocker Land or Bradley Land being real. The Cook supporters are more open-minded. For them, any proof of Bradley Land would give their case a major impetus. However, they do not want to strengthen Peary's case either. Considering how Peary treated their hero, this is quite understandable. But for the purposes of science we have to look at the evidence. I did mention to the Cook Society that perhaps Bradley Land was real, and maybe it was related to Crocker Land. I was politely but firmly told that Crocker Land was definitely not real.

The Cook Society tends to support only one explanation of Bradley Land. They believe it was a drifting 'ice island.' Take a look at Plate 31. It shows several very large hills in the distance in a sea of ice. This is Dr. Cook's only photograph of Bradley Land. Are these hills really glacial ice? Or is this ice-covered land? Wally Herbert states that this photograph can only be of ice-covered land. Glacial ice islands do not look like this. I don't see how one can argue with Wally Herbert on this point.

Prof. Myerson and I had several discussions regarding the possibility of Bradley Land being real. He supplied me with very interesting evidence even though he was not convinced that Bradley Land could be real. His argument, which is quite rational on the face of it, is that if Bradley Land is real then it should have been discovered by now. Precisely! I agree. But, as I asked Myerson, what if Bradley Land has a consider-able importance? What if it has a certain military value and its existence is a military secret? Would the US, Canadian, and Russian Military be prepared to remove an entire island from the world's maps if this was deemed important enough? I explained to

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Myerson that I had examined all the evidence given to me by Sheldon Cook, Russell Gibbons, etc. As I perused this, I could find no fault with it. All of it suggested that Dr. Cook had climbed Mt. McKinley, and that he had reached the North Pole. All of it suggested that he had been honest. But the one thing which could not be explained was Bradley Land. The proposal that Bradley Land was a glacial ice island was highly problematic, because a careful examination of the evidence suggested otherwise. I explained to Myerson that Bradley Land was a gaping hole in the explanations proffered by the Cook Society. I believe that Bradley Land is the Achilles Heel of all the arguments in favor of Dr. Cook. Hence, I suggested to Myerson that the solution to the Bradley Land problem may be stranger than he thinks. I suggested to him that Bradley Land might have a military value and its existence might therefore be classified.

In Sheldon's various papers, he mentioned the problem of both Crocker Land and Bradley Land. Here is what he wrote:

> In 1913, Donald B. MacMillan, a young associate and ardent admirer of Peary, led the Crocker Land Expedition to the Arctic in an attempt to locate Crocker Land which Peary said that he had seen far out in the Arctic Ocean northwest of Axel Heiberg Island in 1906 and which he had named in honor of a major contributor to his expeditions. **Cook had reported in 1909 that en route to the North Pole across the Arctic pack in March 1908 he had sledged near the location assigned Crocker Land by Peary and had not seen it; in 1913**, **Cook had repeated this even more forcefully**, **saying that there was no land at the indicated spot. MacMillan hoped to buttress Peary's reputation as an explorer by proving the existence of Crocker Land and at the same time to discredit Cook**.

Cook supporters find the above to be convincing evidence not only that Cook travelled to the North Pole, but that Cook had been the first to report back that Crocker Land did not actually exist. This is valuable testimony to them, and a position which they would, understandably, hate to reverse. Sheldon Cook believes Bradley Land was an ice island. He writes:

> But the thing that clinches the matter was his [Cook's] discovery of the ice islands. . . This description tallies exactly with the floating ice

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islands that were not officially known to the world until after the Second World War. **They looked like glacial ice because they are glacial ice**. . . **But their nature and origin were not known until the 1950s. Up to that time Cook had been the only person to report them**.

There is no way Cook could have invented or imagined these vast fields of glacial ice with a wavy surface within two hundred miles of the Pole without having been there to see it. The position he gave coincides exactly with the drift tracks measured in the 1950s. . .

Sheldon Cook tells us of Dr. Cook's discovery of Bradley Land:

Cook's photographs of Bradley Land at approximately 85° N latitude and the glacial ice island at 88° N latitude displayed in *My Attainment of the Pole* (opposite page 236, 3rd Edition) must be viewed and assessed within the context of all the evidence pertaining to Dr. Cook's great march north across the Arctic pack to the Pole. **In *My Attainment of the Pole* and in his North Pole Diary**, **Cook asserted that on 30 Mar 1908**, **he saw to the west of his line of march north across the pack an ice-clad land which he named Bradley Land. He described Bradley Land as beginning at 84° 20' N latitude and extending north to 85° 10' N latitude; he judged the coastline of this new ice-covered land to be about 40 mi distant and he thus placed it on 102° of longitude W. His own position at the time he glimpsed Bradley Land to the west was at 84° 50' N latitude and 95° 36' W longitude on the pack ice of the Arctic Ocean. Modern exploration established decades ago that land does not exist at the location assigned Bradley Land by Cook** but it also established with equal certainty that large islands of glacial ice which have calved from the great glaciers of Ellesmere Island are adrift in the region of the Arctic Ocean through which Cook travelled and that the location of Bradley Land lies within the drift pattern of at least two of them. Cook's descriptions of natural conditions in the region of the Arctic through which he travelled, and specifically at the North Pole itself, the first given to the world, have been verified in detail after detail by exploration during the last half-century and it seems probable that Bradley Land was in fact an ice island. **But Wally Herbert in *The Noose of Laurels* contends that**

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Bradley Land as portrayed in Cook's photograph is not an ice island but is ice-clad land. Herbert then draws the conclusion that Cook was not in fact near 85° of latitude N on the Arctic pack because land does not exist at this point or within view of it to the west and Cook would have known this had he actually journeyed to the location from which he claimed to have seen it.

Opponents of Cook have a logical argument which goes thus: The photograph of Bradley Land shows ice-covered land and not glacial ice. Since there is no land where Cook says he saw it, it follows that Cook never was there, and therefore Cook must be lying.

Dr. Cook's supporters have a similar circular logic which goes the other way: Dr. Cook was the first man to report that Crocker Land does not exist. Since Crocker Land does not exist, it follows that Dr. Cook must have been where he said he was.

Both arguments are based on the "proven facts" that neither Bradley Land, nor Crocker Land exist. Strangely enough, even though both arguments are perfectly logical and correct, they nevertheless lead us to opposite conclusions regarding Dr. Cook. This is a very strange and suspicious conclusion. Could this be because some of our "underlying facts" are perhaps not as solid as we believe? Is this logical inconsistency caused by a deeper problem regarding the "physical facts?" Wally Herbert has this to say about Dr. Cook's photograph of Bradley Land:

> In recent years the Cook supporters have become convinced that this picture shows an ice island, a very large piece of drifting ice which has broken away from an ice shelf. The drift tracks of several ice islands have been closely monitored over the last thirty years and this has encouraged the Cook supporters to believe that it was an ice island that Cook claims to have seen to the west of his course on 30 Mar 1908, at latitude 84° 50' N longitude 95° 36' W.
>
> Anyone, however, who has seen the northwest coast of Axel Heiberg Island, and **has also seen ice islands from the surrounding sea ice will know that the picture in Cook's book is not an ice island**, **but a picture of land**, and since there is no land where Cook claims to have taken this picture, we may take it that what Cook's two [Eskimo]

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companions told MacMillan was true.[25]

I wrote to various senior members of the Cook Society and told them that I agreed with Wally Herbert that the Bradley Land photographs did not represent ice islands but real land. Sheldon Cook replied by sending me details of ice islands. In an undated letter to me he wrote:

> In the 1997 issue of *Polar Priorities* is a photograph of ice island Arliss II on page 26. **Such an ice island viewed from a distance of 2 mi across the pack and deduced erroneously to be 40 mi distant because of the condition of the intervening pack would give exactly the impression Bradley Land presented in Cook's photograph**. . .

The photograph on page 26 has been reproduced in Plate 32. Ted Heckathorn's accompanying article mentioned ice islands:

> Both Bryce and Ocszevski discount any possibility that Cook discovered ice islands in the Arctic Ocean. They infer that Cook copied this feature from Peary or some prior explorers. Opinions of experts such as COL Joseph Fletcher and others are ignored. Wally Herbert's photos, cited by critics to prove that Bradley Land and Cook's glacial island were total fabrications, bear a remarkable resemblance to the photo taken by Max Brewer when he discovered and landed on ice island Arlis II on 23 May 1961. Did Arlis II exist as an ice island in 1908? Cook's photo and his description of a glacial island match closely with what Fletcher and Brewer found years later in the Arctic Ocean.[26]

Having looked closely at this photograph, I can't help but conclude that Wally Herbert is right in this regard. Let us compare these photographs. It is true that Arliss II gives the appearance of being a small pyramid-shaped hill. But this is a far cry from what Cook photographed. What is an ice island? According to Wally Herbert, it is a large piece of drifting ice.

The first problem with Sheldon's theory is that of scale. Ice islands are much smaller than the features which Cook photographed. In fact, Sheldon suggests that Cook saw an island a mere 2 mi away and then believed it to be 40 mi away. This is an interesting proposition because in the Arctic one does not have trees or houses or other common objects by which to judge distance and size.

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Could Dr. Cook have misjudged the distance of Bradley Land? Maybe. Are there other ways of judging or inferring distance? One possibility is that distant objects may be more blurred because of the intervening atmosphere, especially if there are hazy conditions. Compare the photographs of Arliss II and Bradley Land and you will see that the hills in the distance seem quite blurred compared with the sleds in the foreground. The hills slightly left of the middle of the photograph seem blurred. The photograph of Arliss II is crisper and clearer. One could argue that the weather conditions were better and the camera used to photograph Arliss II was more modern. I am pointing these things out to get the Reader thinking.

There is another way to get an indication of distance and that is by watching the angular movement of an object as one goes by it. This technique is used in astronomy to estimate the distances of the nearest stars. No doubt you have noticed when you drive or walk that the objects nearest to you appear to go by much faster than objects further away. Trees near the road flash by, while distant hills have a far lesser angular motion. Let us consider the two opposing scenarios: (a) the object is only 2 mil away as Sheldon suggests or (b) the object is 40 mi away as Cook stated. We know that Cook viewed Bradley Land directly to the west as he was travelling due north. This places him in a perfect position to notice its angular motion as he travelled northwards. He was travelling too slowly to have noticed any motion in a matter of seconds or minutes, but he definitely would have noticed this angular motion over several hours. The coastline of Bradley Land was estimated to be approximately 40 mi in a north-south direction. This suggests that he had to travel well over 40 mi before Bradley Land disappeared from view. If Bradley Land was a mere 2 mi away then this would have been impossible. He would merely have travelled a few miles, let’s say 5 mi, and he would have noticed a considerable change in Bradley Land’s position. We do not know exactly how Cook estimated Bradley Land’s height and distance, but no doubt, he would have studied it over several hours and thereby gained the impression, based on experience, that what he was viewing was extremely far away. From what we know, Cook saw Bradley Land on 30 Mar 1908. According to one of Sheldon’s papers, Cook also saw Bradley Land on 31 March as well. According to Ted Heckathorn, Cook was marching northwards at a rate of 16 mi per day after 27 March. It is ridiculous to suppose that he could march north for two days, covering more than 30 mi and still see a small object which was only 2 mi distant to begin

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with, and not realize how small it really is as it rapidly recedes into the distance. Obviously, he could not have viewed Bradley Land over such a period of time unless Bradley Land was very large.

There is a further problem with Sheldon's reasoning. It seems improbable that Bradley Land would have a distance of only 2 mi and yet be 40 or more miles in length. This brings us back to the problem of scale. We may be able to argue about the distance to Bradley Land, and also about the height of Bradley Land, but we cannot argue about its length. It's length is not open to question since Cook had to walk a certain distance parallel to the coastline of Bradley Land in order to establish its length. As Sheldon admits, ice islands are quite small, and ice islands 40 mi long just do not exist.

The next problem is the number of hills in Cook's Bradley Land photograph. While several ice islands have been monitored during the past thirty years it should also be stated that they do not exist in a long line. They lie far apart. Arliss II may account for one of the hills in Cook's photograph. But there are at least three separate hills in that photograph—one of which is more like a small mountain range rather than a hill per se.

The shape of the hills is also different. Arliss II is very angular and pyramidal in shape—as if it is uneroded and "new." Take a look at the hills in Cook's photograph. They are much longer—like little mountain ranges. They are rounded as if covered in snow and eroded with age. They are much flatter than Arliss II.

Just look at Cook's photograph closely. It looks suspiciously like a coastline just as Wally Herbert says. The land in question is very large and covers the entire horizon. In fact, Bradley Land is so large that it continues beyond both the left and right edges of the photograph. We do not know how much more of Bradley Land existed beyond the edges of the photograph.

If you will look closely at the Bradley Land photograph it then appears as if one is looking at dark rock/soil which has snow lying between its ridges. The hills in the photograph are much darker than the snow and ice which is in the foreground.

Now take a closer look at Arliss II. Here we can see snow and ice going right up the ice island to the very top. The patterns of light and dark are very different. Clearly, the only dark areas in this photograph are the ones which lie in shadow. Compare this to Cook's photograph where dark areas can be seen everywhere—on the left, and the right, near the top and the bottom of the hills. The dark areas in the Arliss II photograph are brought about by the

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position of the Sun only. But in Cook's photograph one can see that the hills themselves are made of a dark material which is partially covered with ice.

As one studies these photographs carefully, it becomes apparent that Arliss II is completely different from the features photographed by Cook. I feel very confident in siding with Wally Herbert on this one. This is most definitely the coastline of a land mass.

The question now is: Is this Axel Heiberg as Herbert claims (even though he cannot find any matching features) or does this land mass lie at the latitude determined by Dr. Cook?

The Bradley Land photograph contrasts strongly with another feature which Dr. Cook called the "submerged island." This is glacial ice floating on the sea very close to the North Pole. Photographs of the "submerged island" and Bradley Land exist and they are two very different features. The Bradley Land photograph shows hills of considerable size whereas the "submerged island" is nothing more than glacial ice at sea level. Dr. Cook thought this ice was resting on a submerged piece of land, hence he called it the "submerged island."

It is impossible for both Bradley Land and the "submerged island" to have the same explanation. There is one interesting consideration which I would like to draw the Reader's attention to. All these experts inform us that these ice islands are formed from old glacial ice which was calved from the glaciers on Ellesmere Island. It is said that the Arctic Ocean currents cause this ice to eventually travel the considerable distance to where Bradley Land is located. But, the "submerged island" lay much further north—a mere 120 mi from the North Pole! That is a great distance for the glacial ice to travel. What is to say that these ice islands are only caused by glacial ice from Ellesmere Island? What if the "submerged island," for example, has its origins in glacial ice from a land much nearer the North Pole? Think about that. Dr. Cook's "submerged island," and those other ice islands, might also be related to the existence of Crocker Land and Bradley Land. This is a possibility we should consider. Sheldon mentioned how surprised some people were to find glacial ice so close to the North Pole with no obvious source for it. Maybe this is further proof, that indeed, there is land much further north than we currently see on our maps.

Just when you thought there could not be any more twists to the story, let me add one more. Wally Herbert uses the "fact" that there is no land up in the Arctic, as the cornerstone for his arguments against Dr. Cook. In his

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book, *Noose of Laurels*, he has a photograph of the "submerged island" of glacial ice at sea level. He then goes on to claim that Dr. Cook did not print the entire plate in his book. He claims that when this original plate is reproduced fully, that one then sees a chunk of land on the right-hand side. He reproduces this fuller version of the photograph in his book. Herbert then states that this clearly shows the "submerged island" to be a glacier resting on dry land! In this version of the photograph one can indeed see an enormous piece of dark rock which is many times taller than Cook's companions. Judging by the slope of the rock it seems as if this is the edge of a much higher hill of great size. Since there is no land close to the North Pole, Herbert then claims that Dr. Cook was a liar. But wait. Dr. Cook said the "submerged island" was ice which rested on submerged land a mere 120 mi from the North Pole. Could it be that there really is some rock jutting out above sea level there? Could this be part of a shallow continental shelf related to land which really exists some distance away? To tell the truth, I don't really believe this myself. I think something funny is going on. The piece of rock in that photograph is very large—perhaps 30 ft high, maybe more. It's very hard to tell. But it is very large and must weigh many tons. It appears to be part of a much larger feature. I find it inconceivable that Dr. Cook would spend so much time talking about glacial ice when he could have marked this piece of land on his map as well. His sledges were a few hundred meters away from it, and he could have walked upon it. His testimony contradicts what is in this "full" photograph. He referred to the "submerged island"—believing that the glacial ice rested on land beneath sea level. Now if some land actually stood out, he would surely have drawn attention to it, especially if it was this large. But he did not. He did not remark upon the northernmost island on the face of the Earth. Strange.

I am suspicious of this photograph. Wally Herbert claims he found this photograph in the Library of Congress collection of Dr. Cook's material. As will be seen later, Herbert also discovered that key photographic plates were missing from the Cook collection. Who took them? Dr. Cook's photograph of Bradley Land was missing, as well as the photograph taken at the North Pole. Could it be that the US Government itself has been fiddling with Dr. Cook's polar material in the Library of Congress? I am highly suspicious of this piece of rock in the "full" "submerged island" photograph. Could it be that this photograph has itself been manipulated by someone in a sophisticated attempt at further discrediting Dr. Cook? If there really had been land at that

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latitude, then why did Dr. Cook not mention it? We could always fall back on the “fake photo” theory, but to do so would be to ignore the much greater evidence to the contrary. Is it possible that someone could actually produce a faked plate and place it in the Library of Congress, while removing the original? Who on Earth would have the scientific capability to produce a specially manipulated plate like this? Unless, someone in the US Government, and US Military, has gone to great lengths to attempt to discredit Dr. Cook—in an attempt to hide Bradley Land, and the drifting glacial ice of questionable origin. These people may feel it better to encourage researchers to look towards Axel Heiberg Island where these photographs were supposedly faked, than to have potential explorers flying and traversing the Arctic Ocean where Crocker Land and Bradley Land might exist.

In a paper I quoted earlier, Sheldon Cook mentioned the size of Bradley Land:

> [Dr. Cook] then deduced the apparent size and elevation of the ice-clad phenomenon based upon its supposed great distance from his own position and concluded that **Bradley Land was very large**, **with an elevation of above 1000 ft**, **reaching 1800 ft at its highest points.** Cook almost—certainly saw an ice island but very close to his own position, only a few miles distant, and thus far smaller than he surmised.

It is strange that the Cook Society puts itself squarely behind Dr. Cook and then suddenly makes an about turn on the above point refusing to accept his estimates and conclusions regarding Bradley Land. If he was the competent explorer they claim him to be, then why are they abandoning him on this point?

The photograph of Bradley Land poses serious problems for the Cook Society. Much as they would like to believe him, they are faced with the “fact” that land does not exist at the location given. This is one place where Wally Herbert’s arguments are hard to ignore. This puts Sheldon Cook in a tough spot and he clearly recognizes that he might be faced with a losing battle. So he tries to hedge his bets both ways:

> **If glaciologists should eventually determine that the photograph of Bradley Land in Cook’s book in fact depicts ice-sheathed land**

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> **rather than an ice island, it must be concluded that Cook simply used a photograph of a feature which as nearly as possible approximated what he had seen west of his line of march for the purpose of illustrating his book. The same is true of his photograph of the Glacial Ice Island which he crossed at approximately 88° N; if in fact, this photograph depicts glacial land ice adjacent to land far south of 88° N,** then this photograph was almost certainly the best photographic approximation of what he had seen much further north in the Arctic which Cook had at his disposal for the purpose of illustration. **Cook would certainly have had no reason for fabricating these two geographic features. Ice islands in the far northern Arctic were unknown and unsuspected in 1908 and it is most unlikely that he would have invented them. To give an exact and precise geographical location for two phenomena which were entirely imaginary would have been a tremendous risk, a risk compounded by producing photographs of them. Bradley Land no doubt existed and was seen, probably an ice island as its location falls within the drift pattern of modern ice islands**. . .

What do you think of Sheldon's arguments above? I think Sheldon is undermining his entire position by proposing that Dr. Cook started taking photographs to "represent" things he had really seen. I know of no rule of exploration which allows one to do this. If Cook ever did this, then the onus would have been on him to state so openly in his book. I truly wonder at Sheldon's arguments since Dr. Cook never stated that these photographs were "approximations" of what he saw. He claimed these things were fact and stood by his claims until he died. Bradley Land and the submerged island are the two most important physical features he saw during his assault on the North Pole. For key Cook supporters to begin using this type of logic is highly dangerous. If Cook used photographs to represent physical features, how can we then trust his photographs taken at the North Pole? Sheldon is opening up a Pandora's box filled with problems for Dr. Cook by following this line of reasoning. In a sense, his reasoning leads almost to a direct admission that Dr. Cook was making things up as he went along. And yet, there is so much evidence to the contrary. Sheldon tries to provide a rationale for his above statements. He says that weather conditions during Dr. Cook's attempt on the pole were very poor:

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> But the question poses itself: Why would Cook use photographs taken at one place marked by certain conditions to illustrate similar conditions at another place? In *My Attainment of the Pole*, **Cook says that the day he saw Bradley Land to the west he did not see it clearly because of fog and mists.** Therefore, in order to illustrate his book he almost certainly used a photograph of a body of land which bore a resemblance to the ice-covered land, as he thought it to be, to the west of his route north. **In correspondence with William Shea in 1931**, **Cook commented that conditions on the pack were extremely unfavorable for photography virtually the entire time that he travelled over it to and from the Pole; he stated that a blue haze covered the pack and rendered good**, **clear photographs very difficult to obtain.** Cook cited his photograph taken near the Pole, captioned 'Mending Near the Pole' as an exception; the day was very clear and the photograph was good. **The photograph of Bradley Land was almost surely a substitute or 'stand in' for a photograph which he knew was too poor to use. The day Cook saw what he regarded as ice-covered land to the west was misty and foggy; the land**, **as he thought it to be**, **was at no time clearly seen. In addition to this**, **the thick bluish haze hung over the pack. Bradley Land could not have been land as land does not exist in this location but Cook thought it was land.** Bradley Land was almost certainly, in fact, an ice island as its location lies within the drift pattern of the ice islands but Cook substituted a photograph of what he took Bradley Land to be for purposes of illustration—an ice-sheathed island of terra firma.

Sheldon's argument is that the weather was poor and therefore Dr. Cook must have used photographs from one thing to represent another. But nowhere does Sheldon give us direct information wherein Dr. Cook acknowledges this. I don't see how Dr. Cook could possibly have taken such a course of action during something as important as an assault on the North Pole. If Dr. Cook was an outright fraud one can understand this. But, if Dr. Cook truly was the first person to undertake this journey I do not see how he could have done this without explicitly stating what he had done and why. As Sheldon acknowledges, making up evidence is a highly dangerous undertaking because other explorers will be checking up on it. For example, Cook's photographs show the enormous hills of Bradley Land. Now what if

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someone were to go there and find a different configuration of hills? What then? Such things would not go unnoticed, and Dr. Cook would be called upon to explain this discrepancy. In fact, one of the "rules" of exploration is that later explorers must check up on, and confirm the discoveries of those who went before. Photographs, maps and written descriptions are therefore taken very seriously by geographers and later explorers.

The photograph in Plate 31 may provide us with the answer to the problem. Take a look at the hills shown in this photograph. The hills cover most of the horizon, except for a region in line with the first sledge. At this point there appears to be a gap in the line of hills. When Dr. Cook plotted the coastline of Bradley Land, he drew it as two separate, distinct pieces of land, separated by a gap of several miles. That gap seems to be evident right there in that very photograph. Would you have me believe that he went looking for a feature of the right size, with just such a gap, elsewhere, for photographic purposes? I find that very hard to believe. Why should this photograph seem to reflect, exactly, the facts as he plotted them on a map? I think this photograph really is a true photograph of Bradley Land. He followed its coastline for quite a time, and during that time it is conceivable that he took a photograph when conditions improved.

Wally Herbert mentions another interesting point:

> The search for 'Bradley Land' is made even harder since the only picture available is the one in his book, **the original plate is missing from the Cook Collection at the Library of Congress**, **as are also the plates of the two other crucial pictures: those of his 'North Pole' camp and his 'summit picture' of Mt. McKinley**.[27]

I find it very interesting that all the original plates in support of Dr. Cook's claims are now missing. All we have left are the photographs which are in his books. Now why would all these originals "go missing?" Or has someone deliberately removed them to undermine Dr. Cook's position? Did Peary's supporters remove these photographs? Or did Military Officials go to the Library of Congress to remove these? Who could possibly have the authority to go to the Library of Congress to remove these originals at a later date? Or was this sanctioned by the US Government itself?

What do we make of the "full" "submerged island" photograph? Why did Dr. Cook not reproduce this? Or was this plate produced and placed in the

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Library of Congress in recent years by a US Government which is intent on hiding something in the Arctic? From day one, the US Military had it in for Dr. Cook. Peary, MacMillan and all their military supporters set out to destroy Dr. Cook. Did they do this merely from jealousy or were they, back then, already aware that something untoward might exist in the Arctic?

There was much Hollow Earth discussion going on in the decades prior to the discovery of the North Pole. Were the US Government and the US Military back then already interested in the subject? Remember the letter given to Dr. Kane in the 1850s? Even then, the Secretary to the Navy wanted to know about the Open Polar sea. The Open Polar sea was an integral part of the Hollow Earth theory as it existed then.

Earlier still, a captain in the US Army, from the War of 1812, had lectured a great deal about the Hollow Earth theory. Kafton–Minkel did a considerable amount of research regarding CPT Symmes and made much mention of him in his book. CPT Symmes tried to get the US Government interested in sending an expedition into the Hollow Earth. In fact, all Hollow Earthers, including Marshall Gardner, continually suggested that the US Government find the entrance to the Inner Earth, and explore it, and annex the Inner Earth for themselves. CPT Symmes was probably the loudest and most insistent of all Hollow Earthers—an unreasonable man of the highest order! Symmes' ideas regarding the Hollow Earth were copied directly from Sir Edmund Halley. Symmes believed there were several concentric spheres inside the Earth. In 1825–6, Symmes set out on a lecture tour to drum up support for an expedition to the Arctic to find the Polar Hole. Symmes was so insistent, and so loud about this, that eventually he got a chance to address the Pennsylvania State Legislature at Harrisburg. Fifty of the legislators then sent a letter to the President asking for approval for such a venture. Various unsuccessful attempts were made to get the subject discussed in the Congress and the Senate. The idea never received any official support in the USA. Strangely enough, it was the Russians who were most interested in Symmes' idea. They even invited him to partake in an expedition to explore Siberia where he believed the rim of a Polar Hole could be found. But, Symmes never could raise enough money for the trip to Russia! So that idea died.[28]

For more than a century prior to the discovery of the North Pole, there had indeed been much said and written about a possible entrance into an Inner World via a hole in the Arctic. Many people had attempted to bring this to the attention of various Governments, especially the US Government.

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These Governments never put much stock in these bizarre theories. However, they must certainly have been aware of these ideas. It follows therefore, that if any credible evidence were to later surface, that these Governments might, very quickly, have realized the true significance of what was going on and taken action immediately.

The issues regarding Crocker Land and Bradley Land at first might not have meant much to anybody. Peary and MacMillan were probably motivated by jealously alone and nothing more. However, much later, perhaps during the Cold War, the true importance of these discoveries might have become apparent. This may have required that further action be taken to ensure that no one ever looks seriously into these issues. This might explain the strange happenings to Dr. Cook's material in the Library of Congress. It might have required that a more subtle, and sophisticated attempt, be made to ensure that Dr. Cook remained discredited for the time being—perhaps while the Governments concerned try to find out what is really going on inside the Earth.

What conclusion can we draw regarding Dr. Cook's journey to the North Pole? Take a look at Figure 17.1 which shows Dr. Cook's route to and from the North Pole. I obtained this map from one of Sheldon Cook's papers and modified it to show Crocker Land as is depicted in Wally Herbert's book and to also show (roughly) Peary's route to the North Pole.

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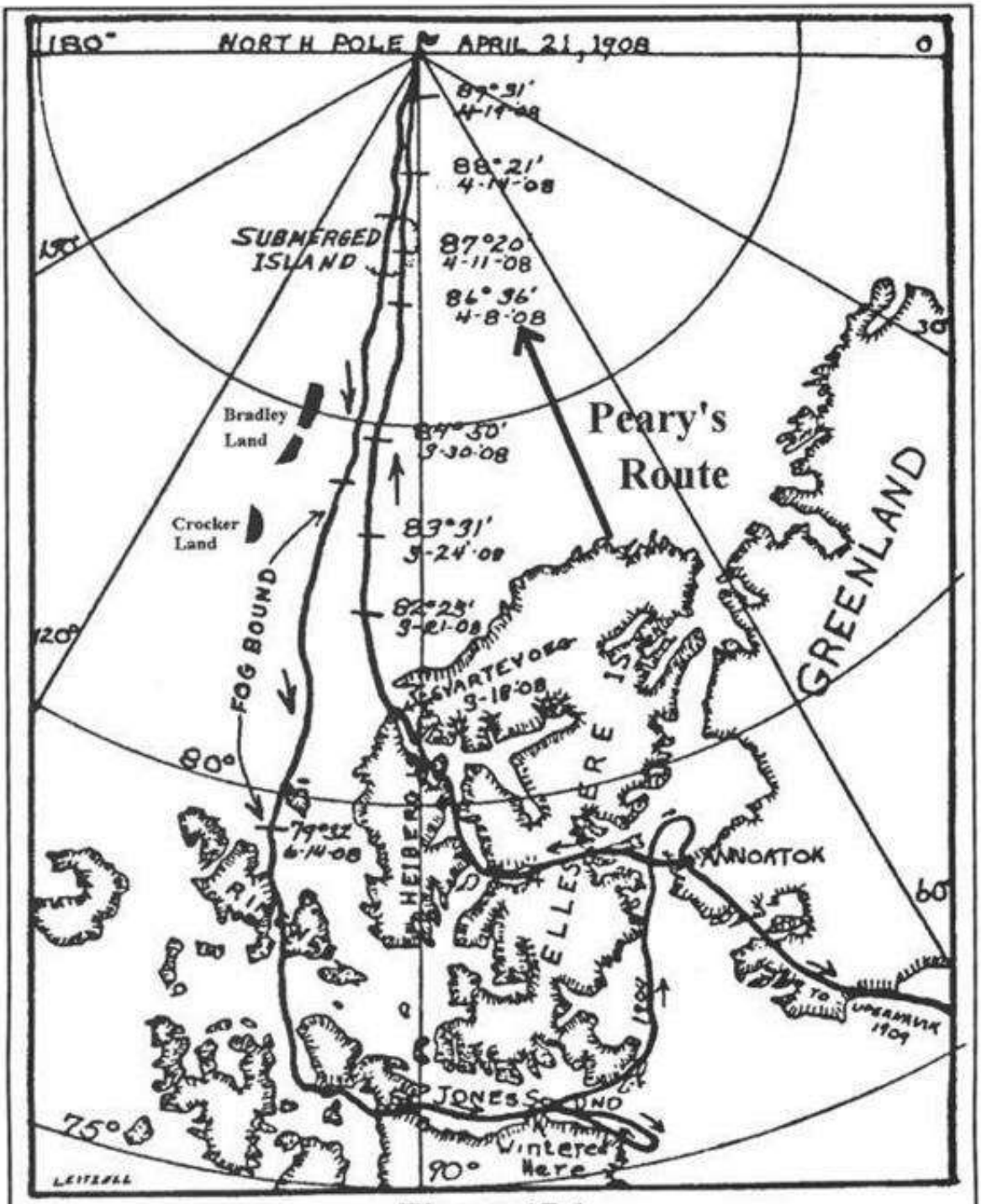

Figure 17.1

Dr Cook's route from Greenland to the North Pole and back

Credit: Sheldon Cook -Cook Society

Firstly, take note of Peary's approach to the North Pole by way of the

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“American route” which lies much further east of Dr. Cook’s route. Peary left Ellesmere Island at Cape Columbia and ventured straight out on to the Polar sea.

Dr. Cook’s outward journey was slightly east of his return trip. On the map are various annotations. For example, on 24 Mar 1908 he was at 83°31’ N, almost directly opposite Crocker Land and yet he did not see it.

Sheldon’s map shows that Dr. Cook was largely fog-bound on his return journey. He also quoted Dr. Cook as stating that during his entire trip the weather was very hazy and visibility was poor. If the Reader will hark back to the discussions regarding mirages, especially those amazing ‘telescopic’ mirages then it will be remembered that they were only seen under the clearest of atmospheric conditions. Remember CPT MacMillan’s sightings of Crocker Land? MacMillan mentioned that it was only seen under the clearest of atmospheric conditions. It seems to me that Dr. Cook’s failure to spot Crocker Land may only serve to provide further evidence that it is indeed a mirage of something considerably distant. At his closest approach to Crocker Land he was almost as close to it as he was to Bradley Land, and yet he still did not see it. We also have MacMillan’s testimony whereby he approached to well within the shores of Crocker Land and even then he estimated Crocker Land to be a considerable distance away. All this joint testimony thus supports the idea that Crocker Land could never exist where Peary thought it was, and that it must lie considerably further away.

Do you remember the immense frontage of the Crocker Land mirage? MacMillan reported the extremely clear atmospheric conditions present at the time. Let me pose a question: How do you or I know that MacMillan did not also see Bradley Land? MacMillan mentioned that Crocker Land sometimes took up 120°–150° of frontage.

Now if you look at Figure 17.1 it should be quite apparent that such a frontage must surely include Bradley Land. Furthermore, MacMillan “moved” Crocker Land to a distance of at least 200 mi from the shore of Axel Heiberg. It is therefore possible that Bradley Land might be closer to Canada than Crocker Land; or that they are both the same distance from the Canadian shore.

MacMillan informed us that there was no indication (in the pack ice) that he was in fact close to land, even at his closest approach to Crocker Land. This also adds to the suggestion that Crocker Land does indeed lie much further away than Peary had thought.

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It seems to me that Bradley Land could easily be close to Crocker Land. Could these lands in fact be one and the same? Dr. Cook did not think so because they lay a small distance from each other when plotted on a map. However, one must not forget that Cook's idea of the position of Crocker Land is based on Peary's 1906 observations. Both MacMillan and Peary saw Crocker Land in the North West. Dr. Cook on the other hand, saw Bradley Land lying due west from his position.

If the Reader will again recall some of the details of those mirages we examined, it should be remembered that many of these 'telescopic' mirages showed land to lie between 30–40 mi from the observer. MacMillan, at his closest approach thought that Crocker Land was not all that far away. So what of Dr. Cook's estimate that Bradley Land was 40 mi away? Is this not open to question too? Could it be that indeed there is no land physically at that location? Can we be sure that Bradley Land really was only 40 mi away? Or was Bradley Land not also a mirage of something much further away?

In a short paper entitled: *Bradley Land: A Glacial Ice Island in the Arctic Ocean* Sheldon mentions other interesting facts:

> As he sledged north across the Arctic pack toward the Pole, Cook glimpsed on 30 and 31 Mar 1908 an ice-sheathed mass on the horizon lying some distance to the west of his position at 84° 49' 56" Latitude N and 95° 36' Longitude W. He assumed that this ice-covered mass somewhat obscured by fog was land, and **apparently because the pack in the immediate vicinity of his camp showed no signs of the massive disturbance caused by the effect of direct immediate land pressure**, **he further concluded that the supposed land was 40 mi to the west**, **beyond the immediate direct**, **drastic influence of land pressure but within range of visibility.** Believing the mass to the west to be land, he placed it on 102° of Longitude W, estimated that it extended many miles running in a northeast-southwest direction and that it had an elevation of about 1000 ft. He named it Bradley Land. In later years, it was determined that land does not exist at this location or near it. **Some have speculated that Bradley Land was a mirage** while Cook's enemies have attempted to use this single and isolated phenomenon as an indication that he was not in fact where he said he was on 30 and 31 Mar 1908.

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Sheldon states that Cook believed Bradley Land was 40 mi away because there were no land pressure effects on the ice pack. He tells us that others have also wondered if Bradley Land was a mirage. The photograph of Bradley Land is very convincing and it looks very real. I have wondered if Bradley Land was a mirage of Crocker Land. The photograph of Bradley Land is very real, and one can't see how that could be a photograph of a mirage. But, we must not forget MacMillan's descriptions of Crocker Land. It was so real that even close-up scrutiny through field glasses could not reveal any flaws—even right at the end when he was convinced it was a mirage. There is a problem with this line of thinking. If the atmosphere was so hazy at the time then how could Dr. Cook have seen a mirage to begin with? Unless perhaps, Bradley Land was a mirage of something much closer than Crocker Land. Hence Cook would have seen Bradley Land but not Crocker Land. These are all possibilities we need to keep in mind.

There is one further exciting thought if one considers that perhaps Crocker Land and Bradley Land are one. Remember that Peary and MacMillan saw Crocker Land to the North West? And Cook saw Bradley Land due West. If one draws their line-of-sight on a map it then results in these lines meeting at a single spot some distance west of both Crocker Land and Bradley Land. Is this where Crocker Land and Bradley Land physically exist? Maybe.

I find this thought interesting in the light of the mirage theory which I have been proposing all along. The distance to this point is not all that great either, which makes me wonder if perhaps we are dealing with a mirage explanation for both Crocker Land and Bradley Land?

The thought that Crocker Land and Bradley Land may be one and the same, and that they lie further west of their supposed positions is tantalizing. This could explain why Bradley Land has also not been found yet—at least by civilian explorers. Perhaps the key to the whole problem is to travel further west of the positions given for these lands?

I see no argument from the Cook camp which can dispute the theory that Bradley Land may be a mirage along the lines of Crocker Land—except perhaps for the photograph. Dr. Cook never tried approaching Bradley Land closely, and since he never tried to get closer to it, we cannot exclude the possibility of it being a 'telescopic' mirage. Remember, Peary was convinced of the distance of Crocker Land, until MacMillan actually tried to go there. The other mirages mentioned earlier had similar characteristics, especially the

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Icelandic mirage.

Furthermore, Sheldon never tells us of any other sightings of Bradley Land by Cook. Notice that Cook was actually closer to both Bradley Land and Crocker Land on his return journey, but never reported seeing them. Sheldon's map shows that Cook was fog-bound in the latter part of his journey, and we have Cook's own testimony that the weather was bad. So it seems logical to conclude that the reason Dr. Cook never saw either Bradley Land or Crocker Land on his return journey was due to the bad weather.

THE MAP EVIDENCE

It had always been my intention to plot whatever I discovered on a map and to then see if any of this makes sense. The Reader is now aware of the position of Bradley Land and Crocker Land on a map. So take a look at Figure 17.2 which shows all these missing lands of the Arctic.

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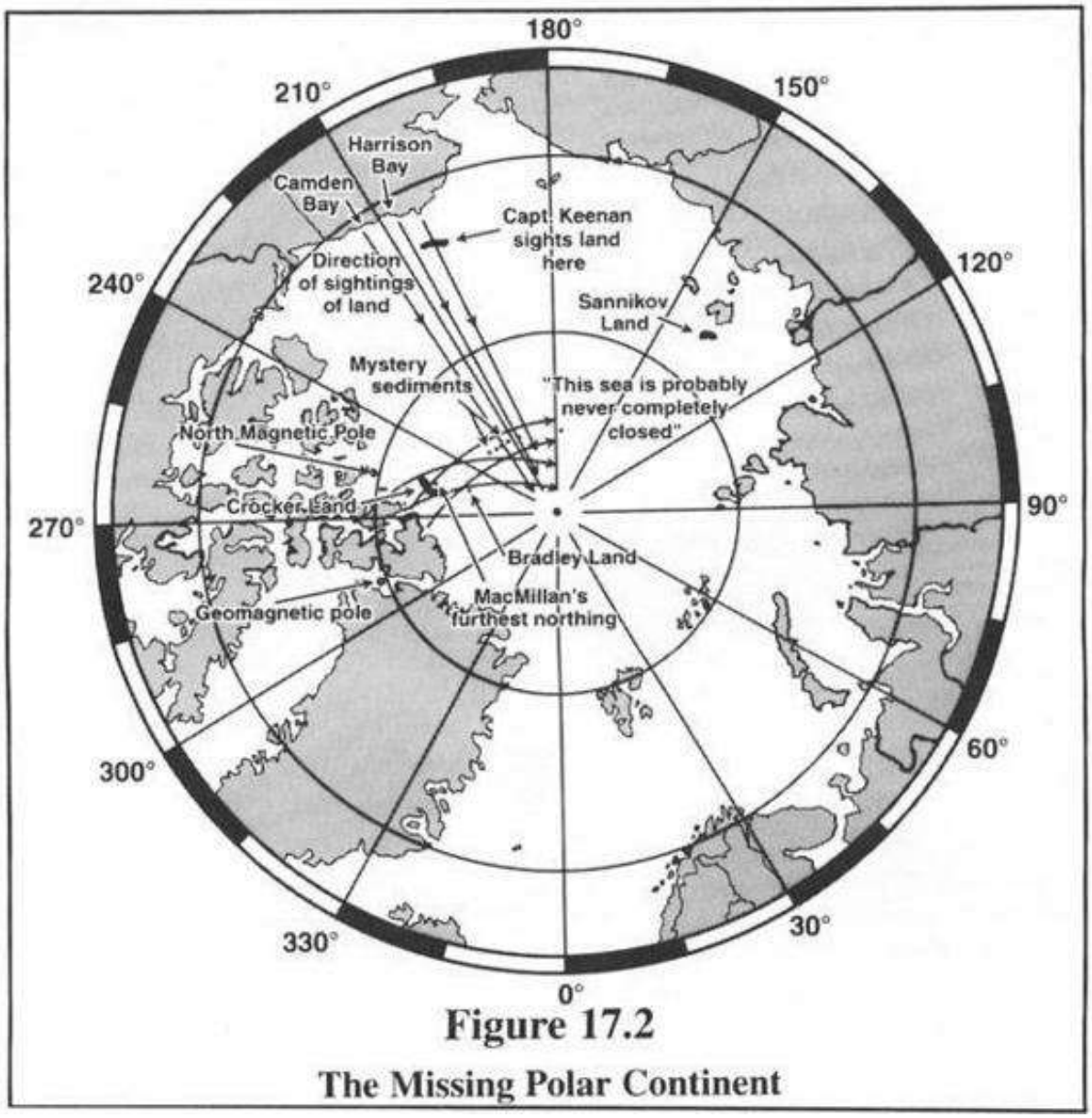

Figure 17.2

The Missing Polar Continent

While I was looking for old maps, Billy Baty happened upon an old map in a text book. Unfortunately we could not discover the origins of this map. Nevertheless, it had some interesting notation on it. Up in the region directly north of the Bering strait, but falling short of the North Pole, it had the notation “This sea is probably never completely closed.” This notation was in the region where LT De Long would have expected to find his Polar continent. One can’t help wondering what caused the map-maker to reach this conclusion, but it has overtones of the Open Polar sea.

Let us also hark back to earlier chapters such as the one on meteorology. In that chapter it will be remembered, we discussed the origin of strange

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clouds which seemed to somehow be related to the Earth's magnetic poles. The direction in which these clouds moved, depending from where they were spotted (e.g. England), seemed to suggest that they originated from the Earth's magnetic or geomagnetic poles. These same clouds, when seen from the USA, did not seem to have that orientation. This is understandable if their real point of origin lay somewhere between the North Magnetic and the Geomagnetic North Poles. Crocker Land and Bradley Land lie at a spot equidistant, almost, from these points as well. Could it be that these lands lie near a Polar Hole? If so, could it be that these strange clouds really originate from a point close to Crocker Land and Bradley Land and that depending on one's longitude, one would mistakenly think these clouds are aligned with the magnetic poles?

The Reader has probably wondered about the relationship between a Polar Hole and the Earth's magnetic field. Should a Polar Hole not coincide with either the North Magnetic Pole or the Geomagnetic Pole? This is a question which I have wondered about many times myself. Strictly speaking, if the Earth's magnetic field originates from inside the Earth, then the magnetic lines of force should direct us straight to a Polar Hole. By this definition, one should find a Polar Hole exactly at the Geomagnetic Pole. The Geomagnetic Pole lies between Canada and Greenland (See Figure 17.2). The aurora, and the Earth's entire magnetic field is centered upon this point, and this is the logical place where one should find a Polar Hole. The North Magnetic Pole (See Figure 17.2), lies closer to the Beaufort Sea—and it moves considerably. The Russians believed for a long time, that another magnetic pole lay in Siberia as well, and that magnetic lines of force bunched together across the Arctic between the Siberian and Canadian Magnetic Poles. Take a look at Figure 17.3. Here I have drawn a line from the Taimyr Peninsula, from whence the Russians believed that magnetic lines of force bunched together and joined up with lines of force from the North Magnetic Pole. As can be seen, these lines of force come very close to mystery sediments which lie very close to Bradley Land and Crocker Land. Larry Newitt, the Canadian scientist who has determined the position of the North Magnetic Pole in the Queen Elizabeth Islands, near the Beaufort Sea, told me that the Russians later dropped their theory of the Russian/Siberian Magnetic Pole. He stated that they believed in it right up to the 1980s.

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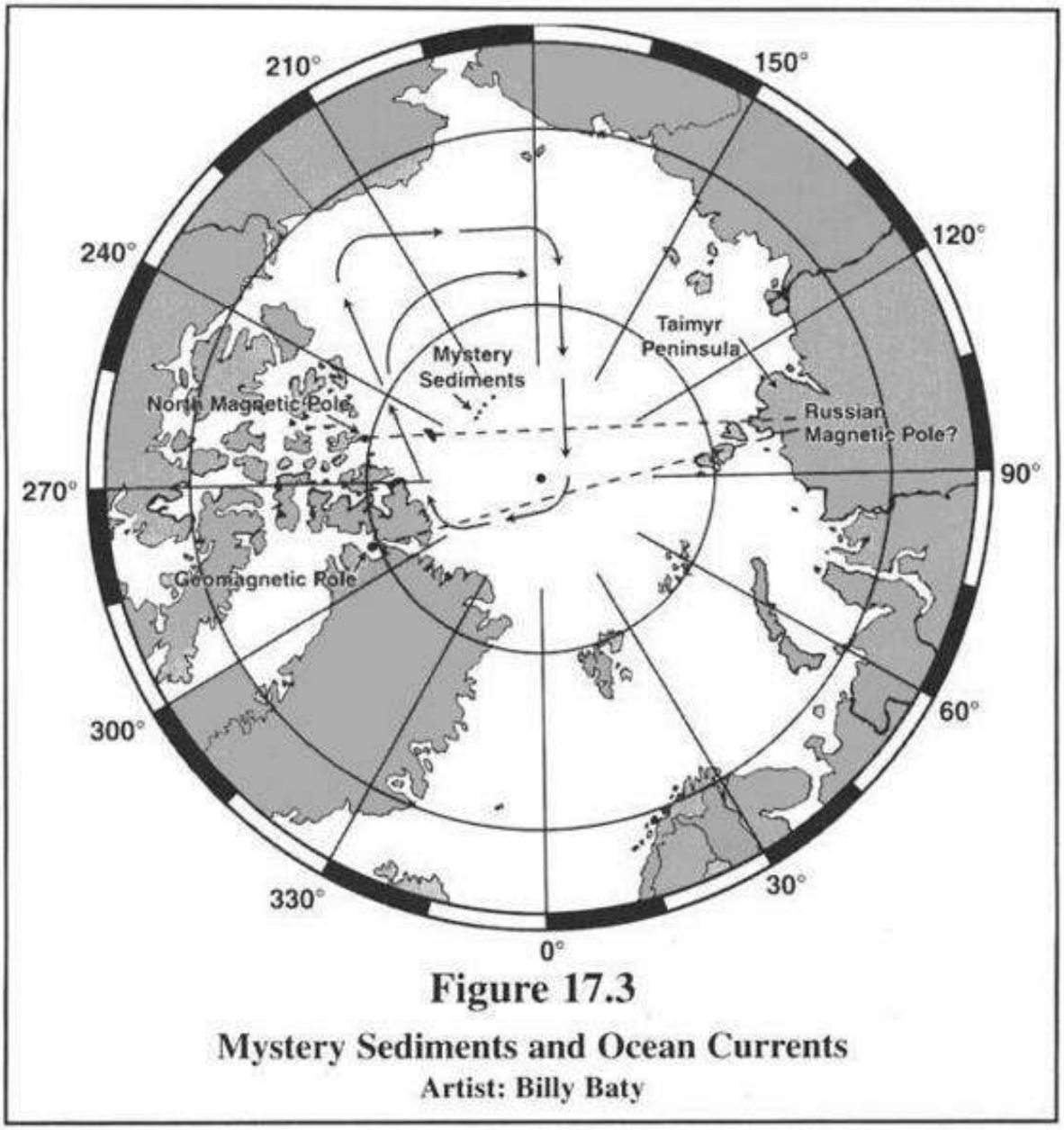

Figure 17.3

Mystery Sediments and Ocean Currents

Artist: Billy Baty

As was mentioned earlier, since the Earth's crust is essentially rigid, it is highly likely that large quantities of ore are down there. This ore very probably distorts the Earth's magnetic field thereby creating a situation where the North Magnetic Pole is a considerable distance from the Geomagnetic Pole. Strictly speaking, the North Magnetic Pole should also be at the Geomagnetic pole. And both of them should actually be at the North Pole because that is the axis about which the Earth spins. The mere fact that the North Magnetic Pole lies a considerable distance from the Geomagnetic Pole is itself anomalous. This clearly indicates that a considerable distortion of the

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Earth's magnetic field occurs near the surface. This being the case, it is to be expected that the geomagnetic field is so distorted that the Geomagnetic Pole does not coincide with the position of a Polar Hole. However, a Polar Hole cannot lie too far away from the Geomagnetic Pole. In Figure 17.3 I drew a triangle between the Geomagnetic Pole, the North Magnetic Pole, and the site of the "Russian Magnetic Pole." One would expect a Polar Hole to lie either within, or close to this triangle. The evidence suggests to me that the line connecting the North Magnetic Pole and the "Russian Magnetic Pole" is the place to start looking.

The Earth's surface is curved and so I should really be using curved lines to connect these points. For the simplistic purposes of this book however, the straight lines should suffice.

Remember too, how storms seemed to have greater impetus if they originated from a point near Alaska? And what of Goesta Wollin's discovery of the link between magnetic fields and the weather? Could this be explained by the existence of a Polar Hole which is relatively close to North America?

Take a look at Figure 17.2 again. Here we see Keenan Land marked near the coast of Alaska. Note too, the Eskimo sightings of land from Camden and Harrison bays in Alaska. Could it be that these Eskimos were really seeing a 'telescopic' mirage of land which lies much further north? Could CPT Keenan's sighting of land actually be a sighting of that same land? Perhaps. If so, the suggestion is that land must lie somewhere up in the Beaufort Sea. And what of the Eskimos who actually travelled to this land and found other Eskimos living there?

My information regarding Sannikov Land is scant. I had wondered if Sannikov Land might simply be the Crocker Land mirage seen from the other side of the Earth! However, that does not seem to be the case because the Russians saw it to the north and northwest. Sannikov Land might be a problem similar to Bradley Land, but from the Russian point of view. Sannikov Land might simply be land lying in the far north, not far from a Polar Hole. It's existence might be covered up for the same reasons that Bradley Land's distance is denied. It might simply be too close to a Polar Hole for comfort to allow civilians to wander in its vicinity.

In Figure 17.2 we see the two parts of the coastline of Bradley Land as drawn by Dr. Cook. He saw these lands lying due west of his position. If we extend his line-of-sight (allowing for a 'telescopic' mirage), we find it curving around the Earth at a latitude of 84° 50' N. In Figure 17.2 we also see

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Crocker Land's original coastline as drawn by Peary. MacMillan travelled to a point beyond that. Both Peary and MacMillan are in agreement that Crocker Land lay Northwest of Cape Colgate and Cape Thomas Hubbard. Extending the line-of-sight in a northwesterly direction on a polar representation of the Earth is a much more difficult task. I have done my best to get this curvature reasonably accurate. Nevertheless, it does demonstrate that the line-of-sight of Bradley Land and Crocker Land does indeed meet. They meet quite a distance away from MacMillan's northernmost approach. It is therefore quite possible that Crocker Land and Bradley Land are one and the same. Although, the likelihood is greater that Bradley Land is merely the eastern-most extension of Crocker Land.

When all these sightings of land and the meteorology are taken into consideration we find ourselves contemplating the existence of land and a possible Polar Hole somewhere due north, or slightly NNE of Alaska, falling short of the North Pole by approximately 5°.

Many people will of course say this is totally impossible. What of those, such as Wally Herbert, who travelled up there in the 1960s? This makes me wonder. I have pondered Wally Herbert's motives for doing such a nasty hatchet job on both Dr. Cook and Peary. Could it be that some of these expeditions across the Arctic have been staged so as to make us think people have been in a certain region when in fact they have not? Wally Herbert was well aware of the slow speed at which his expedition travelled. This has subsequently been highlighted by comparisons with Peary and with Will Steger's 1986 expedition. Herbert accounted for this by saying that he had to make a considerable number of detours around the pressure ridges with his heavy sledges. Really? Or was Herbert making a detour around something else? A Polar Hole maybe? One should not exclude the possibility of sophisticated deception. If something is of critical importance, then clever people, in positions of power, might well go to great lengths to cloud the issues to ensure that these things are not discovered by accident. These are probably patriotic people who are convinced of the correctness of their actions.

Could Wally Herbert's vicious attacks on Dr. Cook and Peary have the deeper motives of discrediting their testimony of Crocker Land and Bradley Land? Consider his theory that Peary lied about Crocker Land simply to ensure that he could raise money for future expeditions of his own. MacMillan's first-hand testimony of Crocker Land makes nonsense of that

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idea. Scientists, to this day, recognize that something is not quite right with the problem of Crocker Land, and no one has come up with a truly satisfactory explanation for it. Since Cook had been thoroughly discredited, the possible existence of Bradley Land was never taken seriously. But, even the Bradley Land mystery is slowly coming to the fore again as people take a renewed interest in Dr. Cook.

Figure 17.2 presents us with interesting visual evidence which suggests that a certain region of the Arctic, slightly offset from the North Pole (by about 5°) is open to suspicion. Strange, off-beat things have been seen here by famous explorers. None of these things, including the strange meteorology we have discussed, seem to make much sense within the bounds of our science.

So far we have only concentrated on Cook, Peary and MacMillan. But, has anyone else seen any indication of land up in this part of the Arctic? Take a look at this introductory e-mail which I received from Prof. Myerson on 17 June 1998:

> Allow me to introduce myself as Ralph Myerson, MD, Vice-President of the Frederick A. Cook Society. Russ Gibbons has furnished me with a copy of your correspondence. . .
>
> I have no expertise in your research; my interest lies mainly in the area of Dr. Cook's medical talents and the many incontrovertible contributions he made to polar medicine. **I do recall that when Amundsen visited Cook when the latter was serving time in Leavenworth Federal prison (another sad story of a travesty of justice)**, **he (Amundsen) expressed some belief in the existence of Bradley Land and stated that when he flew over the area of its location**, **he saw land birds in the region**, **too far for them to have come from the Canadian archipelago**.

I was very surprised by Prof. Myerson's statement above that someone of the caliber of Amundsen should believe in the existence of Bradley Land. Polar explorers in the past often made observations of peculiar animal movements and used it to infer where land might exist—so Amundsen's reasoning in this regard is quite normal.

I asked Prof. Myerson for the source of his information. He replied on 2

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July 1998 as follows:

> I have located the source of Amundsen's statement concerning land birds in the vicinity of Bradley Land. It is contained in Robert Bryce's book *Cook & Peary: The Controversy Resolved*.[29] As you are probably aware, Bryce concluded that neither man reached the pole and was particularly critical of Cook. On page 690, Bryce tells of Amundsen's 1926 lecture tour to the US. While in the Midwest (Omaha), he dropped in to see Captain Thomas Hall, author of a 1917 book, *Has the North Pole Really Been Discovered*.[30]
>
> **Both Hall and Amundsen were strong supporters of Dr. Cook and anti-Peary. According to Bryce, both believed in the existence of Bradley Land, and Bryce states: Amundsen told Hall that at his landing spot in the Arctic in 1924, he had seen two geese and one auk fly away in the direction of Bradley Land and had considered this 'certain evidence of its existence'**.[31]
>
> Unfortunately, Bryce gives no references to document this incident and I could not find any reference to it in Amundsen's account of his 1924 near-disastrous air expedition which was conducted with Lincoln Ellsworth. **The planes made a forced landing at the 84th latitude, very close to Cook's described location of Bradley Land**.
>
> **Then, there's the account by Hubert Wilkins that I think Russ[ell Gibbons] referred to. In one of his flights that took him to a latitude of 85° and at a longitude about 12 mi east of the eastern shore of Bradley Land as located by Cook, his pilot was forced by clouds to descend from an altitude of 7,000 ft. While about 500 ft above the ice, the altimeter recorded an altitude of 1,500 ft above sea level. Wilkins wondered whether instead of his altimeter being in error, his plane was actually close to the surface of Bradley Land**.[32]

Amundsen believed the land birds he saw could not have originated from mainland Canada because they were too far away from it. His observation that the birds flew in the direction of Bradley Land is very interesting. It certainly would be interesting to know what made CPT Hall also believe in the existence of Bradley Land.

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Sir Hubert Wilkins' experience is fascinating. It does however fly in the face of my mirage theory for Bradley Land. His experience with the altimeter suggests that he was flying above "land" which had an elevation of 1,000 ft. This is very interesting because Dr. Cook had estimated Bradley Land's hills to be 1,000–1,800 ft high. Could it be that Bradley Land really is there, exactly at the location given by Dr. Cook? Maybe.

The experiences and opinions of these two famous men, Amundsen and Wilkins, merely serve to add to the corroborative evidence that something strange is going on up there in that region of the Arctic.

SOIL FROM INSIDE THE EARTH?

But it gets stranger still. Consider the following scientific evidence from the magazine *Discovery*:

> How did sand and gravel, **typical of sea-shores and river beds respectively**, **reach the deep ocean bottom of the Arctic hundreds of miles from the nearest land? This has been the puzzle facing the American researchers who have been analyzing ocean-bottom samples dredged up in the Central Arctic Basin not far from the North Pole** from the IGY drifting station Alpha, a temporarily occupied ice floe which circulated **in the region between 84° and 85° N**, **138° to 152° W during eighteen months of 1957–8**.

The article in *Discovery* went on to say that this analysis was the most comprehensive ever undertaken in this "inaccessible region" of the Arctic. The scientists thought the mysterious sand and gravel were a "most remarkable feature" of this part of the Arctic Ocean. They wanted to know where these sands and gravels originated from. They concluded that the sand was not carried there by water because the particles showed very little "rounding." Experience had shown that even a journey of less than 500 m through water increases the roundness of particles by several factors. Yet, the gravel must have travelled several hundred kilometers at the very least, in a straight line to have originated from one of the existing landmasses. Considering that the water in the Arctic Ocean travels in a circular fashion, this translates into a journey of at least "thousands of kilometers." The scientists went on to suggest that the soil got there by "ice rafting." The problem with this suggestion is that there would have to be ocean currents

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capable of transporting large quantities of sand and gravel towards the North Pole. But from which rivers did these sands and gravels originate?[33]

I plotted the position of these sands and gravels in Figure 17.3. Let us take a closer look at the transport problem. Firstly, there are no currents which flow directly towards this spot. The entire ocean in this region tends to flow in a circular fashion. At first glance the Reader might think that these sands and gravels originated from the Canadian islands. However, the problem here is that there are no rivers on these frozen islands of the far north. The most likely rivers which could have provided the gravel are actually in Alaska. But for the soil to have been transported from Alaska (or even Canada) would require it to travel a considerable distance along a circular route out into the Arctic Ocean. Unless the soil was transported on top of the ice, the soil would have been rounded by travelling through water.

When all the factors are considered:

1. Distance travelled
2. Lack of necessary ocean currents for transport
3. Lack of rivers which open up on to the Arctic Ocean nearby
4. Lack of rounding—then these sediments become something of a mystery.

The manner in which the ocean currents circulate also makes one wonder about the ice rafting theory and whether the necessary volume of material could ever find its way there. Unless of course there is land much nearer to this position than the scientists know of. Take a look at Figure 17.2 and see how close these sediments are to Bradley Land and Crocker Land.

Life in the distant Arctic seems almost impossible to consider. And yet, the sub-Arctic, in Canada for example, is much colder than it is out there in the middle of the Arctic Ocean. Do these sediments originate from Crocker Land or Bradley Land? Do rivers flow there? Are there perhaps hot springs up there which make the climate milder thereby enabling some Eskimos, birds and other animals to live up there?

WINDS FROM NOWHERE

Dr. Cook mentioned the considerable haze which was present during his trip to the North Pole. He described it as a bluish haze. Consider the

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following strange information from *Mosaic* in 1978.

Every year, in March and April, a strange haze descends upon the clear pristine air of Alaska. This haze lies at an altitude of 10,000 ft and gives the sky a whitish, diffuse look. When seen from an airplane, it causes the horizon to disappear completely. Scientists studied the haze to try to determine its origin. They discovered it was largely made up of dust and sulfuric acid droplets. Scientists concluded that the dust and sulfuric acid ". . . must be imported because there are no sources of such materials in the Arctic."

They theorized that violent wind storms in the Gobi Desert might be responsible for the dust. However, the sulfuric acid was a greater mystery. They speculated that perhaps the sulfuric acid droplets were produced by Japanese factories and that it was then carried to Alaska by strong winds. However, they were not sure if this was really the correct answer. They concluded that:

> These are speculations, though, and no one is sure where this haze comes from or how far it extends beyond Alaska into the stable, stagnant air over the Arctic Ocean.[34]

Do you remember the presence of sulfuric acid droplets in large quantities in the polar atmosphere of Venus? Could there be a link between such sulfuric acid mist and the Inner Earth?

Mosaic stated that the haze actually extends far out into the Arctic, north of Alaska. Does this haze really come from Japan? Japan lies south west of Alaska. We know from Dr. Cook, that a haze did indeed extend all the way up to the North Pole. Does this haze originate from somewhere near the North Pole? To the best of my knowledge, Peary never mentioned this haze while on his journey to the North Pole. Could it be that this haze emanates from the region where Crocker Land and Bradley Land exist?

Is there a link between this strange haze and Goesta Wollin's discoveries, and the other strange meteorological phenomenon mentioned in earlier chapters? Does this haze provide a natural camouflage for Bradley Land and Crocker Land, making their discovery very difficult? Could this haze and mist be related to large numbers of hot springs on an unknown landmass in the Arctic?

POLAR HOLES

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I just cannot see how a sizable piece of land up in the Arctic could have remained undiscovered to this day. I have thus speculated on whether some of this land really belongs to the outer surface of our world as we know it, or whether it lies inside a Polar Hole of some kind.

And how big could such a hole be? When I originally began this study I had been driven by the idea of a tiny Polar Hole—perhaps as small as 50 mi across. But, as I reach the conclusion of this study, I can't help wondering if it's much larger—perhaps 100 or 200 or more miles across. Take a look at Figure 17.2 at how all the various pieces of evidence converge. It seems to suggest that that one is dealing with a much larger feature. It still falls considerably short of the figure proposed by Marshall Gardner and others, of a hole 1,400 mi across. Nevertheless, it could be hundreds of miles across. Such a feature would definitely have some effect on our weather, and would help to explain some of the strange meteorological phenomenon noticed by scientists.

The eye-witness accounts of missing lands and continents of considerable size in the Arctic leave me wondering about the size of a Polar Hole and any land in or around it. It seems as if we are dealing with a landmass which is very large. It may be that the accompanying Polar Hole is also quite large.

The mirage theory seems to work quite well as an explanation for the strange mirage called Crocker Land. But, the same does not quite seem to be true of Bradley Land. Does Crocker Land therefore technically belong to the Inner Earth while Bradley Land is some kind of outlier which belongs to the outer surface? Perhaps. If so, then why is Bradley Land not on any map? Could it be because it lies near a Polar Hole?

But is there any other way of determining whether there is a hole right through the Earth? In an earlier chapter I speculated about the rising and falling atmosphere of the Earth. I have wondered whether some scientists have perhaps already discovered a hole through the Earth without realizing it.

In the early 1980s, while browsing through the Pretoria public library I came upon a book which discussed the effects of a nuclear war. It was a well-researched book, and I read it. Since the major powers of the world are located in the northern hemisphere, and since a nuclear exchange is more likely to take place in the northern hemisphere the author made a point which surprised me. Scientists had concluded that very little radioactive fallout from the northern hemisphere would reach the southern hemisphere. The accuracy

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of this statement has been confirmed by other people who are knowledgeable in this field. Meteorology teaches us that winds tend to blow from the equator to the poles and back. Hence radioactive material blowing from the north towards the equator is very likely to be caught up by poleward winds and circulated back to the north. This will happen before the radioactive fallout manages to cross the equator into the southern hemisphere. Very little radioactive material will therefore reach the southern hemisphere. The same is true for air moving from the South Pole to the equator—the air will be circulated back to the south.

On 26 Apr 1986, the worst peace-time nuclear accident to date occurred. Fires and explosions were caused by an unauthorized experiment at the Chernobyl nuclear plant in Russia. Thirty-one people died in the immediate aftermath and 135,000 were evacuated from areas around Chernobyl. Some areas were rendered uninhabitable and significant quantities of nuclear material were spread around Europe by the prevailing winds.

Being aware of the virtual impossibility of nuclear fallout reaching the southern hemisphere, you can imagine my surprise on learning that scientists suddenly discovered radioactive fallout from Chernobyl—at the South Pole.

This was reported in *Science News* in May 1990. Jack E. Dibb, a geochemist from the University of New Hampshire collected samples from a snow pit about 38 km from the South Pole. In the deeper portion of the pit he and his colleagues found radioactive layers corresponding to the years 1955–74. Above ground nuclear testing was at its peak during those years. They also found a radiation “spike” which was approximately 20–30 times greater than the normal background radiation levels. They found this “spike” in the snow deposited near the top of the pit. This snow had fallen some time between late 1987 and early 1988. More specifically, they found that the radioactivity came from caesium-137 which does not occur naturally. Caesium-137 only comes from nuclear reactors or nuclear explosions. Scientists have discovered that it takes approximately 20 months for radioactive fallout from nuclear tests in the northern hemisphere to reach the South Pole. The radioactive deposits from Chernobyl also took 20 months to reach the South Pole.

Based on the discoveries of Jack Dibb *et al.*, we can be absolutely certain that the radioactive fallout from nuclear tests and nuclear accidents in the northern hemisphere are indeed reaching the South Pole.

But how? In a letter to *Nature*, dated 3 May, Dibb’s team proposed that

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the radioactive material rose high into the stratosphere, crossed the equator and then fell in central Antarctica.

As can be appreciated, atmospheric scientists, who know how winds behave were very skeptical of this explanation. These atmospheric scientists doubted whether significant amounts of Chernobyl fallout could ever cross the equator and be deposited at the South Pole.

The problem becomes even more mysterious because it turns out that there is no evidence whatsoever that the radioactive material ever crossed the equator to begin with. Radioactive material would have been detected at various places en route to the South Pole, and in other parts of Antarctica. But there was none. Furthermore, as the radioactive material continued its journey there would have been less and less of it as it approached the South Pole. Instead, it turns out that there is a high concentration of this material at this one spot in Antarctica. Dibb tried to explain it by way of:

> . . . special wind patterns above the Antarctic might explain **why the South Pole is the only spot in the southern hemisphere where scientists have detected excess caesium-137 following the Chernobyl event**.

The mystery grows.

But the atmospheric scientists disputed Dibb's explanation. It's one thing dealing with above-ground nuclear tests where perhaps, some of the fallout did rise high into the sky, and some of it did perhaps manage to get across the equator. But, they point out that none of this is true for Chernobyl. The radioactivity from Chernobyl never reached high altitudes as happens with the super-heated air in an atomic explosion. The Chernobyl material lay at a much lower level in the atmosphere. So how could it get from latitude 52° N in Russia to the other side of the Earth?

Jerry Malman from the Geophysical Fluid Dynamics Laboratory at Princeton also disputed Dibb's explanation. He maintained that water condensation in the rising air would have washed the cesium out. He could not conceive how any significant amount of matter could have crossed the equator. Malman's criticism is very valid, especially with respect to the humid air found at the equator.

So the mystery remains. How did low lying radioactive air from Chernobyl in Russia, end up in a single spot at the other end of the Earth,

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along with other high-level radioactivity?

Let's go back to LTC William E. Molett who told me that he had flown more often to the North Pole than anyone else. LTC Molett, as you will remember, was the navigator on board of the modified bombers which were sent by the USAF in the 1950s to collect radioactive fallout at the North Pole. Molett flew 91 classified missions to the North Pole. Molett told me telephonically, that the purpose of the missions at the time was to obtain air samples from the air above the North Pole. Why? Because the radioactive fallout from Russian nuclear tests were blown northwards and were concentrated at the North Pole by natural wind patterns. Over a period of almost five years, Molett continued with these regular flights to obtain air samples from the North Pole. These would be analyzed by American scientists to determine if the Russians had been conducting secret nuclear tests.

We now know that air currents will concentrate radioactive fallout in and around the North Pole. The conclusions of the atmospheric scientists who disputed Dibb's theory are therefore well-founded. So how then does this concentration reach the South Pole? Many Russian nuclear tests are conducted far north. I stand to be corrected, but I think the Russians conduct some nuclear tests on the Kola peninsula which lies at the northernmost point in Russia. I am not sure if they ever conduct above-ground nuclear tests there.

What if there is a hole which goes all the way through the Earth? That is an option which scientists have obviously not considered. What if air sometimes gets sucked into this hole, and is sometimes blown out of it, due to changing air pressures and the changing seasons on the outside of the Earth?

The atmospheric conditions inside a Hollow Planet, regardless of what they are, should be relatively stagnant compared to the outer surface. Any Inner Sun which may be there will remain relatively fixed in position and the surface will suffer from the same level of heat or cold, light or darkness throughout. Hence, there is no reason why atmospheric pressure inside a Hollow Planet should change much except when the Inner Sun itself becomes more active. The major meteorological driving force must therefore lie on the outside of the planet. It is the changing angle of the Earth with respect to the Sun which determines the seasons on the outside of the Earth. When it is winter at the North Pole, it is summer at the South Pole. It seems probable to me that when air is being sucked in through one Polar Hole that it must be blown out through the other. This does of course imply that there must be a

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slight interchange of hemispheric air at the equator to balance this scenario. It follows that some air may be sucked in one Polar Hole, and over time it might end up being blown out of the other.

As an aside, let me add that the atmosphere inside the Earth might be modified slightly by the conditions which are present there. Various chemical and other changes might be made to it while inside the Earth. A scientific study of air entering and leaving the Polar Holes might therefore teach us something about conditions inside the Earth.

Let us return to the Chernobyl problem. If a Polar Hole is located near the North Pole, it then follows that it would suck in the air with the greatest concentration of radioactivity in all of the northern hemisphere. Over time, some of this air would travel right through the Earth and end up being deposited somewhere near the South Pole. We can therefore infer that the entrances to this hole through the Earth lie somewhere near, but not exactly at, the North and South Poles.

There are of course no Polar Holes marked on any maps, but one could consider trying to find them by way of weather balloon experiments. If one has the patience, one could try seeing if weather balloons can be sucked into the Earth at one Pole and then spewed out 20 months later at the other Pole? By tracking these balloons one could establish with absolute certainty whether they travelled along the outside of the Earth or whether they entered the Earth. By noting the points at which they disappeared and reappeared one could then determine exactly where these Polar Holes are.

The mere fact that the low-level Chernobyl radioactive fallout was concentrated in a small area near the South Pole is, to me, highly suggestive of the existence of a South Polar Hole not too far away.

We can do one better than merely guessing at the existence of Polar Holes. We can try to find them. In my research I tried to see if I could narrow down the possible location of a North Polar Hole. The Antarctic has a small population of only 3,000 people and information about it is more scant than for the Arctic. I therefore concentrated my efforts on the Arctic because the chances of success seemed higher. It is also far easier and cheaper to travel into the Arctic to find such a thing. The Arctic has been more thoroughly travelled and studied than the Antarctic. Consequently, there is more data to go on. It is also highly probable, if not a virtual certainty, that the North Polar Hole was discovered first, and therefore one might pick up clues from Arctic exploration since the original discovery would have happened unexpectedly.

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Hence my interest in Crocker Land and Bradley Land and in the early, uncensored, testimony of Arctic explorers.

CONCLUSION

This effectively brings to a close my years of incessant research into the matter of Hollow Planets. It is now four and a half years since the issue was first raised by Jeff, and I look forward to some rest from this obsession of mine!

You can take a look at any map in any atlas, in any country. Look in the vicinity of Crocker Land and Bradley Land and you will find nothing but ocean. The sea floor in these regions has supposedly been mapped too. There is nothing you will find in any literature in geography to indicate the existence of land at these points, or to suggest the existence of Polar Holes anywhere.

In testing this centuries-old idea, I set out to find a hole which might lead into the Earth. There is no scientifically accepted evidence that planets are hollow. It is a taboo subject which only crackpots like myself can entertain. But what if it's true? What if, Dr. Cook and Commander Peary, in their attempts to reach the North Pole stumbled upon the outskirts of a vast land sitting up in the Arctic, near/in a Polar Hole?

What if the full extent of the problem only became clear to the Governments of Russia, Canada and the USA when the Cold War started after World War II? What if, at the height of the Cold War, (when military secrecy was at its greatest) it was discovered that the Earth was hollow?

What of MacMillan's conclusions that Crocker Land was a mirage? The science of optics has come a long way, and what MacMillan saw could only have been based on something else. Peary saw Crocker Land from two different angles days apart. MacMillan, Green and the others saw it at least three times through field glasses and even with the naked-eye, close-up. Peary said it was enormous. MacMillan did too. Then we have Dr. Cook's strange photograph of Bradley Land, Amundsen's tale of the land birds flying towards Bradley Land, and Wilkins' altimeter story. Is Bradley Land real as well? And what of CPT Keenan, and the Alaskan Eskimos and the land which lies north of Alaska? What of Sannikov Land which was also seen three times in eighty years by experienced Russian explorers?

There is no normal reason whatsoever for a Government to lie about the

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existence of land in the Arctic. However, if that land is connected to something awesome, something amazing, which frightens our Governments, then perhaps they might try to hide its existence. I believe therefore, that if there is land up there, that it must, in one way or another, be connected to the existence of a hole which goes deep into the crust of the Earth. Maps are exceptionally accurate these days. Is the sea bed in the vicinity of Crocker Land and Bradley Land really as they say it is? Or is it, perhaps, that such things were concocted so that no one would suspect the existence of such a secret.

The only way to know for certain, is for several private expeditions to go up there and to take a good hard look close-up. A search must be conducted for Bradley Land and Crocker Land. It is probable that the location of Bradley Land is more accurate than that of Crocker Land. If any new land is found up there in the Arctic Ocean, then we must know that indeed, a hole in the Earth can't be far away.

I have made countless suggestions in this book for further experimentation in all manner of fields, including astronomy and polar exploration. I have made these suggestions seriously and I encourage those with the necessary skills to please look into this. I am making a serious suggestion hoping that someone can travel into the Arctic to engage in a serious investigation and to search for these lands which we are told do not exist.

If planets are hollow, then I feel we have a right to know. If there is something inside our world—no matter what it is—then I believe everyone should know about it. This problem of Hollow Planets can easily be solved. All it will take is a little resolve, some intelligence and a bit of hard work. Within a few short years we should be able to answer many of these questions properly. We need not sit back and wait until some Government tells us this is or is not so. If they have lied before what is to stop them from lying again?

Christopher Columbus was an unreasonable man who challenged the erroneous beliefs of his time. He made many mistakes, but by his determination he found a New World. The New World he found may be as nothing compared to the Inner World which might exist right inside this Earth. Are you ready to be the next Columbus?

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Part IV: Beyond Plate Tectonics

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Chapter 18: Plate Tectonics

In this final section of the book I thought it appropriate to take a close look at Plate Tectonics and the movement of continents. I studied all aspects of the Hollow Earth theory which seemed to be appropriate and essential to determining whether a planet could be hollow. However, I have a suspicion that someone will suggest Plate Tectonics as a proof that the Earth could not be hollow, in spite of what I wrote about seismology. Earlier in this book I asked you, the Reader, if you could think of even one reason in favor of the Earth being hollow. Chances are, you could think of none. In a similar vein therefore, I can imagine that many people are so conditioned by the theory of Plate Tectonics that they will find it difficult, nay, impossible, to imagine what lies beyond Plate Tectonics. I have done some of my own thinking on the matter, and this last part of the book deals with "Life After Plate Tectonics." You may be surprised to find that there is such a hope indeed!

Scientists have always believed that continents were permanent. They may be right, for if continents were temporary affairs we would have no land life which could have survived since the Earth formed. Currently, even with Plate Tectonics it is believed that continents are "refreshed" so that they never "die." A friend of mine is a petroleum geologist and we have had many a discussion about this. He remains absolutely adamant that continents are permanent features which essentially remain unchanged. So yes, in order for land life to have survived this long it would seem reasonable to say that continents were always there. But what's to say that they remain unchanged? Geologists are always skimming past this idea—trying to maintain these static continents in spite of erosion.

Erosion is a very powerful force. It is at work every day. Erosion is the result of weather. And weather is the result of the Earth's motion through space. As the Earth alternately heats up and cools down we get weather—and consequently erosion. A spinning Earth heats up and cools down every 24 hours. Due to its tilt we experience seasons. As far as we know, there has always been an atmosphere, and water—and the Earth has been in this motion for some 4,600 million years. It therefore follows that the Earth has

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always had weather—and therefore erosion.

Scientists have measured the rates of erosion carefully. Major rivers wash enormous amounts of sand into the sea each year. It has been found that the current rate of erosion is such that all the continents and islands would be washed into the sea in about 9–11 million years.[1] In other words, if we take the current rate of erosion, and we divide that into the volumes of all the continents and islands then we find that they would only last, roughly, 10 million years. Mountain-building, so we are assured, is the reason why the continents have remained unchanged.

I argued at length with my geologist friend over this, but he remained firm, mountain-building is the answer. I'm not so sure. I tried to demonstrate to him that the patterns of erosion do not match the patterns of mountain-building. Therefore his permanent and fixed continents could not remain permanent, fixed and unchanged as he maintained them to be. I sucked my friend Dr. Gordeev into the argument and he agreed that indeed I did have a point.

If the rate of erosion is so fast, then the continents today would have had to be replaced 460 times since the Earth began! How could the continents remain fixed, permanent and unchanging through all this? No, I cannot accept that the continents are permanent. Nor can I accept that they are unchanging. I think it is extremely improbable that two independent actions, driven by different forces (erosion and mountain-building) should maintain continents as they are throughout the Earth's history. If erosion, for example, is more rapid in say the south of a continent, why should mountain-building be more rapid in the south, just to maintain that continent's shape? There's no logical link between the two actions. It's far more reasonable, that if erosion is more rapid in the south, that mountain-building might be more rapid in, say, the east. Over time therefore, the continent would take on a new shape.

Plate Tectonicists have never stated that erosion is a motive force which drives continents. To them, the continents are relatively permanent, and they have moved because of forces beneath the surface of the Earth. What if this illusion of permanence has been induced by tremendous cataclysms which completely destroyed whatever was there before?

Anyhow, from a purely logical standpoint, I find it hard to believe that continents are permanent and unchanging—in spite of the lack of evidence. I was so obsessed with this idea for a time (before I became interested in Hollow Planets), that I contemplated producing a computer model to support

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my arguments. I did not need to bother, because in the planning stages of such a model I realized what the answer would clearly be. The answer is simply that a continent is eroded away from all regions except where mountain building takes place. Thus a continent's shape will always change, and the mountains where the mountain-building is taking place will always become the center of the continent. But look at any topographical map of the world and show me a single continent where the mountains are in the middle? There are none —except maybe some of the mountains of Asia and some small islands. Take a look at small islands with large mountains in their center. That is what all the continents should look like. They should all have mountainous backbones running down their center.

Erosion is so rapid, that if you take a look at an island like Britain—how long do you think that island will remain above sea level? Having looked through some erosion statistics I would make a tentative stab at a few hundred thousand years. You doubt that? Well, take a look at some historical records from England regarding erosion and you will be surprised at how some parts of the British coast have eroded away at up to 21 ft per year. Most of the erosion is much slower, but it is nevertheless significant and often amounts to a few feet per annum. Each year Britain is growing smaller.

Most scientists are convinced that Plate Tectonics correctly explains the structure of the Earth—near the surface. Let us examine the upper parts of the Earth and look at the crust and the "plates" which collide with each other, and ask ourselves: Is this truly the only valid scientific explanation for the state of the upper Earth?

How well does Hollow Planet theory cope with Plate Tectonics? Let us begin with Wegner's "Continental drift" theory which was later transformed into Plate Tectonics. One notes (with some humor I might add!) that "Continental drift" was regarded as a crackpot theory for 60 years. How things change!

From the Hollow Planet point of view, the apparent movement of the continents could be explained by way of multiple Pole Shifts. A second consideration would be gravity. If gravity behaves differently deep inside the Earth, then one might find a type of "isostacy" (i.e. negative gravity) which may allow huge chunks of land to sink to the bottom of the sea, while at other places seabed may rise to become dry land. This too might give the impression of continental motion when in fact something altogether different has happened.

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James Hutton is considered the “father of geology.” In 1785 he advanced the theory of uniformitarianism (also known as gradualism.) This theory basically states that the present is the key to the past. In other words, the forces that shaped the Earth throughout its history have been uniform and they operate in the same manner and at the same rate today as they did in the past.[2] Hutton’s gradualism is the ruling paradigm in geology today.

Sir William Thomson (Lord Kelvin) was a professor of natural history at Glasgow University. Back in 1864 he chided uniformitarian writers for ignoring obvious evidence that the Earth had a violent past and then trying to show that it was the result of uniformitarian action over a long period of time. He used strong words, stating that they “have argued in a most fallacious manner against hypotheses of violent action in past ages.” Kelvin was convinced that violent events had shaped the Earth’s past.[3]

I would like to caution the Reader against taking gradualistic concepts too seriously. I feel there are too many potential holes in it. I know of no test which can prove conclusively that gradualism is absolutely correct—when one is dealing with events which took place hundreds of millions of years ago. In an age where we struggle to predict the weather one week in advance, it is with some degree of skepticism that I read of events which occurred millions, hundreds of millions or even billions of years ago. Even though we have much evidence in the soil at our feet, so much more may have been destroyed or damaged in the process that I am not sure the present can really be regarded as a key to the past.

My impression of geology is that there may have been many cataclysms in the past and that interpreting the physical data is extremely difficult—leading to many possible alternatives. I doubt very much whether the geologic history of our little planet is as smooth and gradualistic as many scientists try to portray. I am not even sure I have faith in the dating processes—for the simple reason that the underlying assumptions are suspect. Just because certain ratios of atoms exist now, it is not to say this has always been the case. When dealing with dating in recent history where we can take objects several hundred years old and test them —well there we can have some measure of confidence in the results. But when one is dealing with events millions of years ago there is no way of checking the results. There is so much thumb-sucking going on when one deals with events millions and billions of years ago that I am highly sceptical of the results. We could regard the results as possibilities, but I think it is quite foolish to imagine them as

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certainties. It's not a criticism of scientists. It's just that we may find ourselves in a situation where the physical evidence has been destroyed and our view of the past is highly fragmented—so fragmented as to be virtually useless. I wish to caution the Reader against gradualism and uniformitarianism as trustworthy scientific concepts.

Gradualism is a nice idea. It is essentially a straight-line system of predicting the past. It assumes that on a planetary scale things flow along pretty smoothly, with no unexpected upsets. It's a nice concept. I have always been struck by the sheer fragility of this concept—as concepts go. The past is so rigidly bound to the present. The slightest deviation and the whole thing can come crashing down. Scientists no doubt have always been aware just how fragile this concept is. Scientists have sometimes fought tooth and nail to do away with talk of catastrophism because that kind of talk can bring down much of the neat picture of our planetary past. However, in the last two decades, cometary strikes annihilating dinosaurs and other species have come to be accepted by science as a whole. No doubt some feared that by letting catastrophism in through the door that other gradualistic concepts may become victims to the domino principle—and they too will ultimately fall down. They may be right. Perhaps the process has already begun because some scientists have dared to suggest that Pole Shifts might actually take place. My own opinion is that much of geology is filled to the brim with evidence of massive catastrophism. Here in my own country, we have evidence of some of the greatest catastrophes which have ever struck the Earth. The Karoo system is an example of a catastrophe on an incredible scale. What was seabed became dry land and fish were fossilized by the billion. What caused it? How do shoals of billions of fish turn into rock so that their fragile scales leave perfect imprints in solid rock? Across the Earth one finds many other examples of incredible catastrophes.

It is with a somewhat jaundiced eye that I look at the neat pictures of the past. In the next chapter we shall be reviewing repeated biological extinctions and perhaps even a periodic nature to these events. I suggest that the Earth itself may be the major cause of these catastrophes—perhaps through the Pole Shift mechanism. That comet strikes may have occurred over and above these cyclic catastrophes is a fact I have no problem accepting. Thus one catastrophe may help to blur the other, making the evidence extremely difficult to interpret. There is no doubt in my mind as to the tremendous difficulty of determining what really happened in the past—and in what

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sequence. The Reader too, should be aware of this in assessing the data. My general view is that the Earth's past seems to have been quite violent—even the recent past. The idea of a placid planet with super-continents gradually breaking up and drifting apart leaves me some-what cold. It may amount to no more than wishful thinking when all is said and done. Hutton had a nice idea. Most of us have nice ideas and neat theories which are then dashed by reality. Ask anyone who has ever raised children! Why should science be impervious to this? Indeed, science is littered with similar neat ideas which turned out to be only partially true. Once upon a time the Greeks thought they understood climate perfectly. Their neat theories showed that climate was determined by latitude. They lived by these ideas very literally believing that travel to the equator was impossible. Yet, these ideas turned out to be false because of climatic modifiers which the Greeks had not considered. We must also not be too dogmatic. Hutton's idea no doubt has some validity, but I think that there may be other modifiers which may impact it considerably so as to make gradualism largely useless for all practical purposes.

Currently science accounts for the movement of continents by means of a specific model which shows a super continent breaking into several pieces which then drifted apart. But can this strict scenario cater for all the various scenarios which geological evidence presents us with? I have my doubts.

Current theory holds that the continents moved and that the planet remained in the same position. I have wondered how this idea works with landmasses containing enormous ice caps? How does one move a continent which has an enormous ice sheet thousands of feet thick lying on it? Shouldn't the tremendous weight of such an ice sheet anchor a continent down?

Just as many parts of the Earth once lay at the poles, so too did many parts of the Earth seem to have been at or near the equator at one time. In Siberia, Alaska, Britain and Antarctica we find the remains of tropical animals. The fossilized remains of tropical animals are found in many very cold regions of the world. Can all of this be accounted for by the break-up of a single continent?

Interestingly enough science has some difficulty reconciling the Earth-bound Plate Tectonic theory with the lack of evidence for Plate Tectonics on other planets. This is another area where the Hollow Planet idea seems to have a unifying effect because it seems to apply to all planetary bodies across the board. Simply stated, Plate Tectonics may be nothing more than the

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misinterpretation of the physics of a Hollow Planet.

PLATE TECTONICS

Alfred Wegner was a meteorologist. He collected data attempting to prove that continents moved. He called his theory “continental drift”. The theory was regarded as a fringe theory by serious geologists and scientists who regarded the Earth as unchanging. Then in the 1960s evidence was discovered that sea floors were spreading. Overnight this 60 year old crackpot theory was embraced, renamed and adopted by serious scientists. Since that day, it has been the reigning paradigm in terrestrial physics. Such are the fashions of science! As with all theories, there was considerable debate back then, but then the debate died down as most accepted it. Plate Tectonics is now accepted as proven fact.

Prior to the development of plate tectonic theory scientists had believed that the planet’s crust was an essentially static feature. They believed it to be a rigid structure which was only disturbed by local effects and some vertical adjustments due to the weight of the continental areas. Plate tectonic theory caused them to view the upper layer of the Earth as a mobile, ever-changing system. To geologists who were used to a static Earth, movements of even a few centimeters per annum were regarded as a dizzying pace of change. Prominent geophysicists regarded Plate Tectonics as a new intellectual revolution.

This revolution was the product of 15 years of study by Earth scientists of many disciplines. Many of them studied the ocean floor, taking core samples and looking at its record of past magnetic reversals. In the *Science News Yearbook* for 1970 it states:

> **. . . out of the reaffirmation of the once-discredited theory of continental drift** as refined by the concept of sea floor spreading has evolved a theoretical world view. . . [called Plate Tectonics].

Plate Tectonics supposes that the upper part of the Earth (its crust and mantle) is rigid. This is called the “lithosphere”. This layer is thought to be considerably strong and to be roughly 100 km thick. It floats on a second layer called the “asthenosphere” which has no strength and which extends downwards for several hundred kilometers. Their view of the Earth is analogous to a layer of ice floating on water—where the Earth’s crust

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behaves like the ice.

This “lithosphere” (crust), is divided into vast blocks or plates which are bordered by ocean ridges, trenches and faults. These plates spread apart at the ocean ridges and grind against each other at the faults. In some places one plate is thrust under another (subduction) creating island arcs and deep ocean trenches.

A French scientist, Dr. Xavier LePichon, proposed a simplified model that requires only six plates to provide a consistent picture of the global pattern of surface motion, based on the data from sea floor spreading. He proposed the existence of an American plate on which North and South America rested as well as the western half of the Atlantic Ocean. The other plates in his model were: the African plate; a Eurasian plate; a Pacific plate as well as an Australian and Antarctic plate.

These plates are thought to have moved across the surface of the Earth over billions of years carrying their cargo of continents and ocean sediments with them. Where they spread apart at ocean ridges hot basaltic material rises up from the mantle and hangs off their trailing edges. The ocean ridges are often broken into sections creating faults perpendicular to the ridge. Small earthquakes are created when the plates rub against each other along these fault lines. This is seen as being some of the strongest evidence in support of the theory.

The Earth’s major topographical features are thought to have formed in the regions where the plates collide with each other. Dr. LePichon deduced that when two plates collide at a speed of under 6 cm per annum, then they tend to fold and buckle creating mountain ranges such as the Himalayas. If the speed is faster than 6 cm per annum then one plate thrusts under the other, descending into the asthenosphere at an angle of 45°. Such incidents are thought to have produced great trenches such as the Tonga Trench in the Pacific and several others. Seismologists have traced the rough outline of these plates as they dive into the Earth.

Even so, scientists still do not understand where the energy comes from which drives the process. Scientists generally thought that differences in temperatures under the oceans and continents could create a convection current within the mantle. This slow current would move like a conveyor belt which would split the plates apart to form a ridge and then move them horizontally. Another idea which was proposed was that a sinking plate cools the mantle which then produces a convection current which moves the plates.

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Another alternative theory was that gravitational forces on the down-going slab exert a pull on the surface plate. In the fall of 1969, Dr. Egon Orowan, at a meeting of the National Academy of Sciences, proposed that an asteroid-sized meteor could have set Plate Tectonics in motion. The initial stresses created by such an impact could then spread by gravity alone—he theorized. Although he did not present any evidence in support of his idea.

There were great hopes for plate theory in its early days. Some scientists believed that this was the "golden era of geology" and that Plate Tectonics would be able to explain virtually everything about the Earth's surface. Yet even then, it was recognized that there were problems which Plate Tectonics could not explain. Dr. W. Jayson Morgan of Princeton University commented:

> For the gross picture it is right. **But there are many details, especially if you call Hawaii a detail; there is no reason why Hawaii should exist." He also pointed out that the theory fails to account for seismic activity in Nevada or for the creation of the Rocky Mountains, in an area some distance from any plate collisions**.[4]

Today, Plate Tectonics is the reigning paradigm. It teaches that the Earth's crust is broken up into several enormous plates which float on a dense but semi-liquid material. They crash and rub against each other. This causes earthquakes and creates mountain ranges. But does the evidence really fit so neatly into Plate Tectonic theory?

We are told that originally a super continent existed which then broke up. The various parts which made up this continent then drifted apart and became the continents which we know today. This implies that each continent only moved a certain distance and only moved across certain latitudes during its existence. Stated in another way, it means that no single continent moved everywhere across the face of the Earth—that there is a limit to the distance each continent could have moved to the latitudes they occupy today.

Did the continents move by way of continental drift or by planetary Pole Shift? The original Pole Shift advocate, Prof. Hapgood, felt that the Earth's crust slid over its semi-liquid interior.

A Pole Shift might be one way of telling whether the Earth is hollow or not. A Pole Shift might also provide us with the final evidence as to whether

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the interior is semi-liquid or not. For example, Prof Hapgood's reasoning is very correct—but only if the interior is semi-liquid. If the interior is semi-liquid then once the friction is overcome, the Earth's crust could move at very high speeds (hundreds of miles an hour) and it will destroy virtually everything in its path. If the Earth is hollow, then the Earth's crust must be solid. A Pole Shift under those conditions should be much tamer than the Hapgood scenario. The Earth might suffer massive quakes but only tilt by a few degrees. However several such tilts would drastically re-orientate the Earth over millions of years. The evidence suggests to me that Pole Shifts might be cyclic and may be necessary to ensure the continued existence of land above water.

If Hollow Planet Theory has any validity then it must of course answer questions which the reigning paradigms can answer. The current paradigm tells us that:

1. That continents are permanent features upon the face of the Earth.
2. That these continents have moved.

If the Hollow Planet point of view is correct then the following would be true:

1. That continents are **not** permanent features upon the face of the Earth.
2. Continents cannot move, therefore it must be the Earth which has moved.
3. New continents may be created virtually overnight from the seabed by earthquakes—and perhaps destroyed too by the same mechanism.

The current paradigm must supply the answer to how continents move. Hollow Planet Theory must supply the answer as to how the planet as a whole may move. Then too we must examine the evidence to see which which idea provides the best fit.

MOUNTAIN BUILDING AND CONTINENT SINKING

It is my conjecture that continents are born of and also die due to massive earthquakes. This view is quite contrary to current geological

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thinking. Yet, even on a small scale, earthquakes have been observed to do great damage and cause permanent changes to dry land.

Consider for example the violent Alaskan earthquake of 28 Mar 1964, which disturbed both the atmosphere and ionosphere, to say nothing of the large-scale crustal distortions. Bruce A. Bolt recorded the air waves at Berkeley. Exceptional atmospheric waves, resembling those from large nuclear explosions, had been recorded at Berkeley after the earthquake. This severe earthquake occurred 3,130 km away from Berkeley near the head of Prince William Sound. **Displacements of the adjacent seabed generated a damaging tsunami which was observed at numerous places around the Pacific. Changes in sea level indicate that the mainland in the disturbed region along the coast rose about 7 ft, while a portion of Kodiak Island subsided by about 5 ft.**

The 1964 Alaskan earthquake demonstrates what earthquakes are capable of—that some land can sink, and other areas can rise. The question is whether some quakes can cause land to rise or fall by several thousand feet. Now that is not an idea which scientists will take seriously at all. Scientists are aware that in the early history of the Earth, that earthquakes measuring 12 or even 13 on the Richter scale occurred. But have such quakes occurred in the last 1 million years? Scientists would no doubt insist emphatically that this could not be so. Let us examine some of the evidence for continent sinking.

Let us first examine the flat-topped seamounts beneath the ocean known as guyots. The guyots all seem to be truncated volcanic cones, but the origin of the truncation is still being debated. The popular view of scientists is that guyots are caused by wave-planing. That they are mountains which once were above sea level. Then their tops were eroded away once they sank partly below sea level—hence they are now flat topped. If the guyots are truly wave-planed (the popular view), then large changes in sea level and/or very deep down-warping are implied. The big questions here are: Did the mountains subside, or did the ocean levels rise—and how fast did this happen?

Guyots are found in the Pacific Ocean between Hawaii and the Marianas. There are approximately one hundred and sixty of these flat-topped peaks under the ocean. They seem to be volcanic islands which rise about 9,000–12,000 ft from the seabed. Their flat tops generally lie from 3,000 to 6,000 ft below sea level. Some of the less-developed ones are deeper. The

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flat-topped surface is normally bordered by a gently sloping shelf which is approximately 1–2 miles wide. Since their flattened tops lie at different elevations, differing from each other by as much as 1,000 ft, it is supposed that they are all of different ages. There are some groups of peaks which do have the same elevation.

H. H. Hess suggested that the guyots are very old—probably from pre-Cambrian times. He advanced the tentative hypothesis that the sea level has risen since the time these guyots were formed. He suggests that the sea level has risen because of the accumulation of sediments on the sea floor. He goes on to theorize that: ". . . the deeper the surfaces are the greater their age."[5]

In the above the Reader should note that not all guyots have flat tops at the same level. This rules out a single sea level rise which could have caused them. The theory put forward by Hess is that the lower level guyots are the older ones. His only way out of that is to suppose that the other volcanoes formed after the earlier ones were eroded away (otherwise they would all have had flat-tops at the same level). But his explanations is by no means the only one which fits the evidence. Here is but one of a myriad of instances in geology where the evidence is too inconclusive to provide one with a big-picture of what really happened. An alternative explanation could be that the volcanoes which originally formed the guyots have undergone more than one rise or fall in their levels. The wave planed tops no doubt formed at a time when their tops were above sea level and waves eroded them down. But some of them may have later subsided further by way of a sinking seabed. This option cannot be ruled out.

After Hess wrote the above, further investigations were conducted which revealed that the guyot surfaces are actually very young. These events must have happened much more recently than he supposed, and it throws doubt upon his gradualist solution.

In 1951 R. Revelle reported that geological and geophysical investigations of the Pacific Ocean floor indicated that large-scale geological activity had occurred "during relatively late stages of Earth history." Paleontological and seismic evidence suggested that the Bikini Atoll began to form on a volcanic base in the Mezozoic or early Tertiary periods. The seamounts of the mid-Pacific mountains currently lie at depth of 2,500–6,000 ft below sea level. Shallow-water fossils dredged from this region suggest that these seamounts were very near sea level during the early Tertiary or late Cretaceous period.[6]

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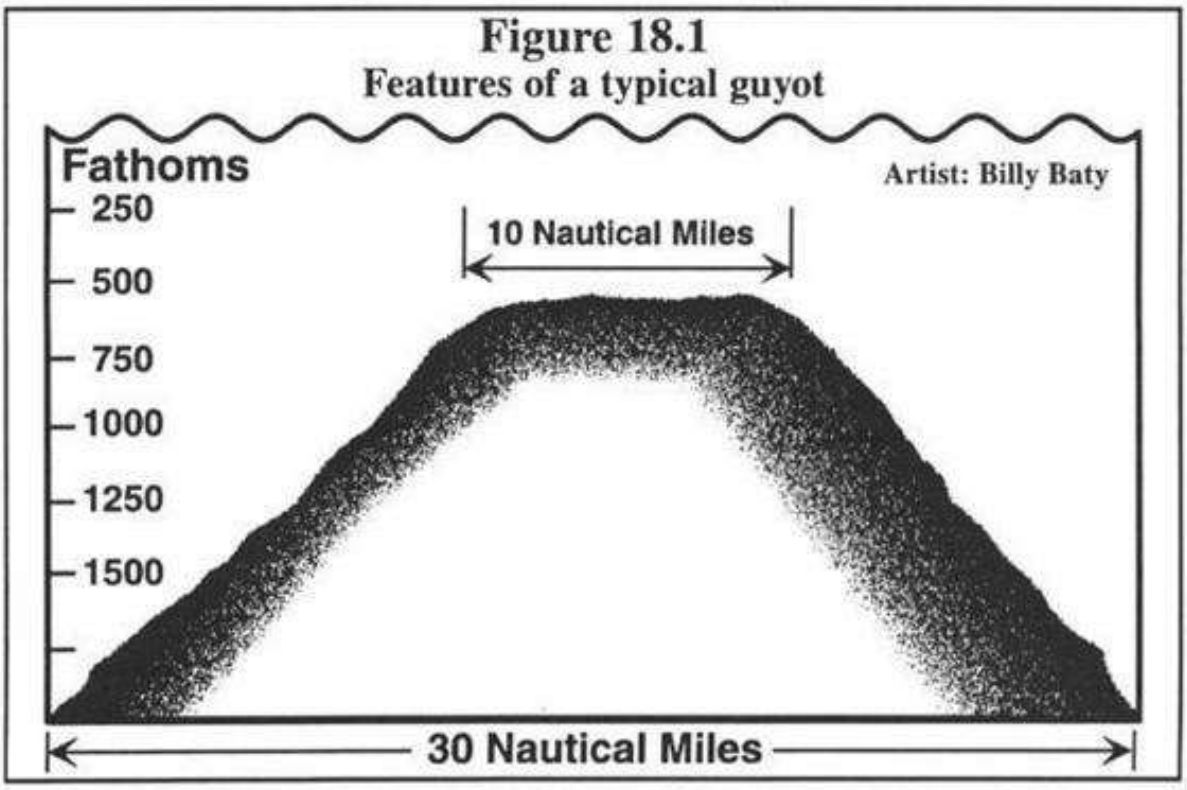

In 1959 R. Dietz reported that the fossils dredged up from the guyot tops are the oldest recovered from any of the oceans. Curiously, not all the guyot tops are level. Some of them are tilted. Some guyots are also surrounded by moat-like depressions. Regarding this, Dietz opined: “Good evidence that our so-called terra firma actually has failed.” Dietz notes that since the guyot tops lie at different levels one can rule out a general large-scale change in sea level. The evidence instead favours the individual subsidence of the guyots.[7]

Dietz thus rules out sea level changes as the cause of guyots. Sea level changes are often invoked by scientists to explain what might really have been subsidence. The most important fact in the above is that not all the guyot tops are level. Some are tilted. It is absurd to suppose that the oceans “tilted”—so the only feasible alternative is that these individual guyots were themselves tilted after they were eroded away by the waves. The wave-planing must have taken many years, and that was followed by further subsidence and tilting—which took them even deeper into the ocean. I concur with Dietz and his conclusions that the guyots could only have been formed through subsidence which tilted some existing guyots, while bringing other volcanic cones lower to form new guyots. The picture thus presented is of large scale subsidence in many parts of the ocean—some of this subsidence

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going on for long periods of time, thus creating this jumbled undersea topography.

E. Hamilton suggested that the extinctions of organisms in the mid-Pacific mountains was brought upon by the local sinking of the ocean floor. In 1968, D. Fisher, *et al.* agreed that submergence had resulted in the death of the Albian–Cenomanian reef-dwelling fauna of the mid-Pacific mountains. They wished to expand the thesis to include the Japanese seamounts. They pointed out that the area over which this occurred was very large—much larger than Hamilton had supposed. Instead, they proposed that the sea level had risen. (Which as Dietz noted earlier is in contravention of the facts regarding guyots.) With regard to Hamilton's proposal that the seabed had subsided they stated:

> [The submergence is not local] **. . . but involves a considerable portion of the Pacific Plate. The concept of Plate Tectonics suggests no process whereby such a large segment of the ocean crust might founder,** yet it does suggest mechanisms that would cause sea level to fluctuate. . .

This statement is quite remarkable. It seems to be a clear instance of the facts being ignored in favor of purely theoretical considerations. It sounds remarkably like an instance where the facts do not fit the theory and therefore the facts must be discarded. They go on to state that they have no evidence to suggest why the sea levels would have changed, except that it appears that sea level changes in the mid-Cretaceous were global.[8]

It would seem from the above that large crustal areas can sink. This conforms to my proposal that enormous areas—entire islands, and perhaps even entire continents can rise from the seabed or perhaps even sink. This might be related to erosion within our Hollow Planet. Could underground water erode away enormous caverns which eventually weaken and cause the continents far above them to cave in? Could such falling land perhaps compress oceans of water inside the Earth and by way of hydraulic principles cause land elsewhere to rise? Could falling land in one part of the Earth cause land to rise—perhaps even seabed to rise and form dry land? Does the Earth's crust behave something like a water bed? If you press down on it in one spot, could it rise at another?

Some seamounts have distinct terraces rather than flat tops. This seems

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to provide evidence for several instances of subsidence which took place at short intervals of time (perhaps thousands or tens of thousands of years apart). Thus the oceans did not have enough time to wave-plane the entire cone, before it subsided some more. Is this related to cyclic Pole Shifts?

B. Heezen *et al.* noted that the two undersea mountains (Bowie and Cobb) in the north-east Pacific have terraces of about 216 m which appear to have been eroded and cut away by waves. They theorize that perhaps these mountains were once below sea level, and were then uplifted to sea level, for a time, where the waves cut a terrace in them. These mountains then subsided again. Or, perhaps the terraces were cut during the formation of the seamounts.

Maurice L. Schwartz of Western Washington State College disagreed. He pointed out that these terraces were at a uniform depth and that there were similar terraces at the same depth throughout the Pacific. He said that this suggests a general lowering of the sea level. One terrace in the south-western Pacific was dated at 13,600–17,000 years old.

Heezen *et al.* pointed to other studies which suggested that the seamounts had subsided very recently. Studies of the Atlantis seamount showed it to have a flat top at depth of about 180 ftm. A ton of pteropod limestone cobbles was dredged from its summit. The state of lithification of the limestone suggests that this seamount may have been an island within the last 12,000 years!

Studies of the Cruiser and Great Meteor seamounts in 1952 showed them to have larger and flatter summits at depths of 150 and 165 ftm. Their sandy summits did not show evidence of ripples or cobbles, but symmetrical ripples were photographed on the slopes at depths of 1,200 to 1,400 ftm. Heezen *et al.* concluded that: “These youthful ‘guyots’ may have originated as volcanoes which were later capped by limestone and **more recently have sunk beneath the sea.”**[9]

The really staggering point in the above is that these guyots sank beneath the ocean within the last 17,000 years. They may have sunk by as much as 1,200 ftm! This also implies rapid sinking—rather than slow sinking over millions of years. Further evidence that these guyots submerged recently comes from the fossils found on their tops. Here, we review the occurrence of relatively recent, shallow water fossils on guyot tops —an indication that these seamounts were recently submerged by thousands of meters.

In 1974 J. L. Mathews reported on the results of dredging operations on

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guyots in the mid-Pacific mountains and the Japanese seamounts. They found mid-Cretaceous fossils which indicated that ". . . that submergence killed off the fauna of the reefs." Mathews opted for a rise in sea level as the explanation for the submergence of the guyots.[10]

The Atlantic seamounts are predominantly conical rather than truncated. Typical guyots are rare, and even some flat-topped Atlantic seamounts may not be wave-planed. Nevertheless, there is evidence of deep submergence.

In 1974 the research submersible Alvin inspected the Mytilus seamount which is one of a group called the New England Seamounts. They discovered rocks which contained an algae which has been identified as Melobesia. J. H. Heirtzler states that Melobesia is:

> **A family that now grows on the outermost ridges of reef breccia platforms in less than 100 m of water. Its occurrence at the great depth offers firm evidence that this seamount has subsided by 3,000 m.** [He estimated the rate of subsidence at 40–60 m per million years. He also pointed out that]. . . **no land volcano is known to have subsided 3,000 m**.[11]

As always, the gradualist answer is proposed.

Dr. Bruce C. Heezen and Paul J. Fox studied rock which was dredged from the base of a 25,000 ft underwater limestone cliff. This rock contained shallow-water life (mostly corals) in rock that is under 5 mi of water of the eastern end of the Dominican Republic. The corals and organisms normally only grow in tropical lagoons and shallow reefs. Once upon a time this area must have been near sea level. Yet:

> **. . . somehow, they say, this portion of the Earth's crust sank by more than 20,000 feet during the past 150 million years.**[12]

Here we have a staggering case of subsidence by 20,000 ft. Mt. Everest is 28,000 ft high—so that will give the Reader an idea of the scale of this happening. Did this really happen over 150 million years? Even so, this is at odds with plate tectonic theory.

In 1957, R. W. Kolbe reported finding freshwater diatoms in the deep Atlantic, some 930 km from Africa, roughly on the Equator. He offered three possible explanations:

1. African rivers carried the diatoms into the sea and ocean currents

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transported them the 930 km

2. The diatoms were present in dust blown out to sea from Africa

3. **The section of the Atlantic where the fossil diatoms were found was once at the surface, and supported freshwater lakes**.[13]

The above is even more startling. Here we may have had a freshwater lake on dry land. Both the lake and the dry land seems to have become seabed. This goes totally against the grain of Plate Tectonics which proposes that continents are relatively permanent.

The anomalousness of the mid-Atlantic diatoms was accentuated by K. K. Landes in an article in Geotimes. Landes noted that Kolbe is an authority on diatomology who discovered over 60 freshwater species in deep sea sediments in the mid-Atlantic near the equator. He noted that one core especially contained only freshwater diatoms—except for a single fragment of a marine diatom. Landes wrote **"with regard to diatoms, this level gave the impression of belonging to a freshwater sediment.** He noted that Melosira Granulata (a freshwater diatom) was present in large quantities in this core along with 17 other freshwater species. The "freshwater community" seemed to be confined to a thin stratum in the core. Landes stated:

> That this thin bed, containing thousands of freshwater diatoms to one fragment of a marine form **could have slid, slumped, flowed or blown into place is simply unbelievable. If there ever was a bed in situ, this is it.**

Geologists have attempted to account for these freshwater diatoms through the action of turbidity currents. Kolbe seriously doubted whether turbidity currents could carry the diatoms 930 km and then upwards more than 1000 m to deposit them on top of a submarine hill.[14]

Scientists propose that the sea levels fluctuated throughout the history of the world. They normally propose ice ages as the solution to the problem. They propose that ice accumulates to such an extent that sea levels fall. I have no doubt that this is partially true. However, the evidence suggests to me that this is only part of the story. This might be a misinterpretation of a combination of Pole Shifts and changes in the height of land as well as variations in ice cover. The Earth's geological history is extremely complex and there might be no easy answers.

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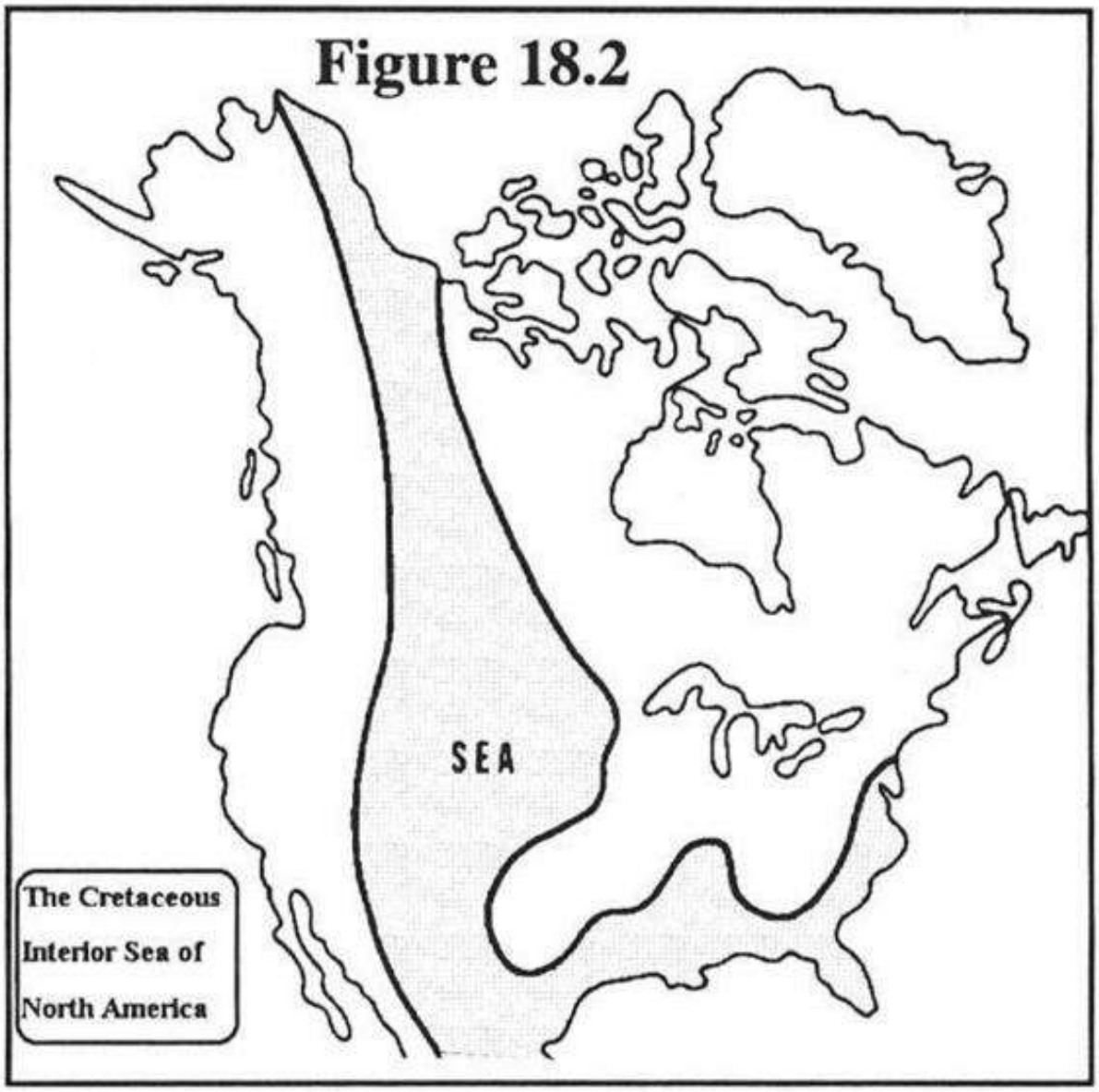
As can be seen in Figure 18.2, North America was once divided in two by the Cretacious interior sea. The question is this: Was this ocean due to rising sea levels or was it due to part of North America being at a lower elevation than now and thus being seabed in the true sense of the word? What if Pole Shifts are violent enough to destroy much evidence of what came before? It may be very difficult to reconstruct the past accurately, which is why I am skeptical of gradualism as the cure-all for geological problems. No doubt it has a role to play, but I think the reality is much more complex.



FIXED CONTINENTS

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The roots of continents might actually be so deep that they cannot possibly move—even by current scientific theories. A scientist who holds this view is Paul Lowman. One scientist, Morgan , proposed that volcanic hot-spots are caused by plumes from deep in the mantle. Lowman notes that if continental drift is caused by the motion of tectonic plates then one should find hot-spot trails on continents. Although many such trails have been proposed, Lowman commented:

> However, it now appears that none of them is valid and that the distribution of several large continental volcano fields actually indicates fixed continents.

He pointed out that at a time when the continents are thought to have drifted considerably that the African continent had remained stationary. The African plate seems to have been stationary for at least 300 million years with respect to the mantle. The distribution of volcanic ages in central Europe is more consistent with a fixed continent than with one moving over a hot-spot. The hot-spot tracks proposed for North America also do not show any systematic changes consistent with a moving continent.

Lowman proposed that the eastern Australian highlands are a better candidate for hot-spot tracks because the radiometric ages of the volcanic rocks decrease from north to south from 4–40 million years. This would seem to be consistent with a continent moving over a hot-spot. Lowman then notes that: ". . . volcanic action persisted in the north, when it should have ceased according to simple hot-spot theory." He notes that other theories are able to explain this volcanism without requiring the existence of hot-spots.[15]

Apart from the lack of hot-spot trails, Lowman cites other evidence for fixed continents, namely the depth of continental roots. The problem has to do with the interpretation of seismic data. In 1975, most geophysicists concluded that the continents were less than 125 km thick. D. Anderson, employing different techniques, determined that continental roots existed as far down as 200 km—but no deeper. T. Jordan, using the same techniques asserted that the seismic data actually showed continental roots extending down to 400 km or more. Over the years Jordan has changed his views slightly by stating that continental roots are normally only 250 km deep but they may reach a maximum depth of 400 km. Anderson's current views are that there may be seismic anomalies deep beneath the continents due to cold

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mantle rock sinking beneath the continents. These, Anderson maintains, are not true continental roots per se.[16]

The Reader should be aware that scientists using the same techniques differ as to what the data means. There is a great deal of smoke and mirrors when one is dealing with seismology for the simple reason that no one has been able to go down to those depths to actually see what is really there. Instead one has scientists who are analyzing seismic data with computers and trying to draw conclusions as to what it means. Sometimes a change in the algorithms results in quite different interpretations.

Closely associated with the controversy over the depth of continental roots is the effect that such roots would have upon continental drift. One can easily imagine the braking effect deep roots would have upon the mobility of the continents.

In 1985 Lowman noted that if Jordan is correct, then deep continental roots would inhibit and probably prevent continental motion. Lowman also questioned the strength of the force which is thought to drive the plate tectonic process. Lowman proposed that continents were fixed.[17]

As can be seen, scientists disagree with each other over the interpretation of the seismic evidence. This takes us back to the deep-focus quakes mentioned earlier, which strongly suggest that the Earth is solid down to 700 km. It would seem that Jordan, Anderson and Lowman have realized that something is wrong with plate tectonic theory and that the upper crust of the Earth is much thicker than Plate Tectonics allows for.

SINKING CONTINENTS

The results from many deep sea dredging and drilling projects confirm the widespread existence of continent-type rocks in the oceans. The accepted theory of Plate Tectonics states that oceanic crust is formed as basalt wells up along the ocean ridges, forming conveyor belts of crust that move away from the ridges toward the continents. When continent-type rocks are found far from the continents themselves in very deep waters, a mechanism explaining their presence must be found.

Geologists have found granites and other “continental” types of rock far from continents (e.g. granites). In 1971, M. L. Keith compiled a list of the submarine plateaus, islands and oceanic sites where these rocks have been found. Keith proposed that perhaps these rocks are continental fragments

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which have been moved away from the continental edges in a manner similar to that proposed for continental drifting. The problem with his proposal is that the direction of motion is exactly the opposite of that maintained by plate tectonicists. How can a single “conveyor belt” of ocean move some rock from the mid-ocean ridges to the continents while moving other rock from the continental edges back towards the ocean? Keith had taken this stance because of other difficulties which he had perceived. Keith argued that the conventional explanation for the existence of this rock was that it had been carried there by ice. But, he pointed out, one finds inclusions of granity, syenite, etc in the volcanic rocks of Ascension island in the mid-Atlantic. And one finds nepheline syenite blocks on the Indian Ocean ridge. Keith pointed out that such inclusions cannot be explained by ice-rafting alone. He pointed out the existence of a number of separated and subsided shelf areas around the Atlantic. He mentioned that there were several other spots where continental rocks have been detected in the ocean deep. He pointed out that various places such as Blake Plateau, Orphan Knoll and Flemish Cap possessed the characteristics of continental shelves. Keith noted that:

> Orphan Knoll is some 500 km from Newfoundland and separated from it by waters up to 2,500 m deep. Furthermore, Orphan Knoll is built of graded terrestrial sandstone containing fragments of anthracite coal.

He pointed out that Rockall and Lousy Bank in the North Atlantic are further from the continental shelf and they too appear to be shelf areas. Keith concluded that sea floor spreading from the mid-ocean ridges did not provide an adequate mechanism for moving segments of the continental shelf away from the continents.[18]

The mention of anthracite coal in Orphan Knoll is very important. Coal only forms from forests. This is now found 500 km from dry land. Keith was actually going against the grain of tectonics by saying that instead of crust moving away from mid-ocean ridges it is actually moving towards mid-ocean ridges! This is one of those delightful instances where there is data to support both totally opposing views! It simply illustrates how complex terrestrial geology really is.

Keith’s arguments might simply mean that most of the time sea floor spreading occurs, but that on occasion the forces move in the other direction. That’s one possibility. If tectonics does not exist, then one could easily end

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up with contradictory forces moving in different directions since there never was any such pattern to begin with—which I think is the case.

Louise Purrett pointed out a theoretical problem with the Caribbean basin. In 1969 large quantities of granite boulders and pebbles were dredged up from the floor of the Caribbean, from depths of up to 1,800 m. Seismic surveys of the Caribbean basin indicated the existence of granite underneath the entire region. She suggested that the Caribbean basin might have been a very large segment of subsided continental crust. She noted that there did not seem to be enough room for the Caribbean basin in the pre-drift continental fits. This had caused some geologists to believe that the continental rock under the Caribbean basin had been formed 150 million years after the drifting had begun. This solution, she noted, was also problematical because plate tectonic theory has no mechanism for generating new continental crust.[19] The issues raised by Purrett are extremely difficult to account for using plate tectonic theory. Firstly, large chunks of continental crust are not supposed to sink. And if that did not happen, then where did the continental crust come from which underlies the Caribbean? Was the Caribbean basin once dry land?

Was the Gulf of Mexico once above sea level? Petroleum is usually considered a continental type of “rock”. Yet, it has been found at great depths in the Gulf of Mexico. For example, at Site 2, Leg I, of the Deep Sea Drilling Project, cores brought up showed signs of petroleum from the Challenger Knoll 3,572 m down.[20] The Glomar Challenger sailed the oceans on an 18 month mission to look for evidence of continental drift. The crew drilled approximately 60 holes in the ocean floor. A 472 ft core was extracted from the Sigsbee Knolls in the Gulf of Mexico. These submerged hills stretch for more than a thousand miles under the ocean. Oil was found oozing from the soft, porous sandstone. The core samples revealed that the Sigsbee Knolls were salt domes. Salt domes are often found in oil fields on land. Some scientists had thought it highly unlikely that salt domes could exist deep in the ocean because salt deposits could theoretically not form there. Altogether 170 or more salt domes were found underwater.

> ‘Either the 170 or more salt domes were formed by geological processes that are so far unknown,’ says Dr. Benson, or ‘the entire gulf is a huge down-dropped block of continental crust. If the latter is the case, the gulf is the first known example of a large section of Earth’s crust falling so

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far.’[21]

The discovery of deep sea magnetic stripes has also raised new issues. It was expected they would form neat, uniform magnetized stripes on the ocean floor. Instead cores from drilling programs suggest that the ocean floor is a jumble of separate, differently magnetized regions, each meters in extent and each displaying different polarities.[22] All of these issues strike at the heart of Plate Tectonics and call much of it into question.

TERRANES

Terranes are blocks of continental or oceanic crust that possess characteristics suggesting that they originated from locations far from their current positions. Often Terranes from radically different origin are welded together. Terranes are usually “exotic”, which means they come from different and distant parts of the globe. This requires a transportation mechanism which can collect blocks of crust over a wide area and then reassemble them elsewhere. Scientists expect this mechanism to be the same as the one which causes continental drift. But is this idea really workable? Can the slow “conveyor belts”, which move from the mid-ocean ridges to the continents really explain the existence of exotic terranes? How do rocks, which are unrelated to one each other magnetically, paleontologically and geologically arrive at the same place? In some cases the rocks seem to have been moved thousands of miles from their place of origin.

Scientists are now considering a new concept called “Microplate Tectonics” which deals with small pieces of crust which range in size from a few miles to hundreds of miles. The old conveyor belt idea has been retained, but they still have to find a mechanism to explain how a miscellany of rocks and crust manage to attach themselves to continents far from their origins.

It all began in the 1970s when paleomagnetic evidence in south-western Alaska suggested that the rocks found there had formed further south. Paleontologists also discovered the remains of extinct single-celled organisms in Alaska. These organisms were not native to North America. They were however, characteristic of Asia. At the time some scientists were afraid to make the radical suggestion that the rocks had broken off of something in the Pacific. Instead, they proposed that the rocks had slid up from the coast near Washington and Oregon. It was only later, when other

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researchers from Canada and Washington began publishing similar sorts of results that they decided to publish their own. One scientist, Stone, made the following remarks during an interview: “Everybody had information like that in their files, but they just held on to it until somebody had the courage to publish.”[23] Stone’s statement is very revealing. I have often wondered just how much bizarre information, perhaps even relating to Hollow Planets may lie quietly in the files of scientists across the world, scientists just too scared (because of scientific peer pressure), to come out and make a statement which goes completely against the grain of current theory? Even though there is much information assembled in this book, I wouldn’t be surprised if there was even more.

TECTONIC STRESSES

A. A. Meyerhoff and H. A. Meyerhoff were among the first scientists who questioned the new Plate Tectonics. As mentioned before, the seabed is seen as a gigantic conveyor belt which transports material from mid-ocean ridges to the continents. This implies motion away from the mid-ocean ridges (e.g. eastwards, as well as westwards.) The Meyerhoffs point out that several major structures on the Earth’s surface seem to reflect the existence of stresses which are directed from the west to the east only. This can be seen in various island-arc systems, deep sea trenches and large-scale wrench-fault patterns which seem to be the product of eastwardly directed stresses. They wrote:

> However, as the new global tectonics evolved, numerous major crustal features were observed which did not fit readily into the simplistic schemes of the ‘new’ tectonics.

As examples, they cite the convex-to-the-east island-arc systems and the several papers which scientists wrote trying to explain them. They also pointed to the lack of true island arcs along the western margins of the continents and also to the existence of wrench-fault patterns which formed in a west-to-east stress field that have not been explained by the advocates of the new global tectonics.[24]

There are a few geologists who believe that the Earth has expanded. A small number of “maverick” geologists believe that the Earth is currently expanding. The major proponent of this idea is S. W. Carey of the University

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of Tasmania. One geologist told me that he did not believe the Earth is currently expanding but that it had expanded once upon a time.

In 1981, B. M. Ciric questioned the reality of subduction as a geological process. He pointed out that Benioff thought that oceanic plates subducted under the continental plates on reverse faults. Benioff thought this created trenches and would explain volcanism as well as deep focus quakes down to 700 km. Plate tectonicists happily accepted Benioff's hypothesis to explain why in spite of the widening of the oceanic floor, the volume of the Earth had not increased. Ciric states "Considerably later the imagined phenomenon was called subduction." Ciric, Carey and other adherents of the expanding Earth theory rightly point out that if the sea floor is widening then there needs to be subduction or else the Earth will expand—indefinitely. As can be seen in Figure 18.3, the main subduction zones in the world are mainly in the Pacific ocean. But the sea floor also happens to be spreading in the Atlantic. Ciric points out that there are no marginal or oceanic trenches in the Atlantic Ocean which would be evidence of subduction in the Atlantic. There are no trenches nor evidence of subduction in the Indian Ocean next to Africa, Madagascar, India, Antarctica and Australia. Volcanism and seismicity in Africa is not related to subduction. Ciric points out that volcanism and earthquakes should be connected to the zones which are parallel to the trenches where subduction is supposedly taking place. But this is not the case —for example Mt. St. Helens, Mt. Etna and the volcanoes of the Lipari Islands. The hypocenters of earthquakes in the Mediterranean region are also shallower than theory demands, occurring no deeper than 20 km. Benioff also supposed that the initial slope of the subducting plates was 34° and that they would move at a rate of 2–16 cm/yr which would cause the folding of sediments. The slope of the sides of deep sea trenches however is mostly 5° and the sediments in them are horizontal rather than folded. Ciric concludes that:

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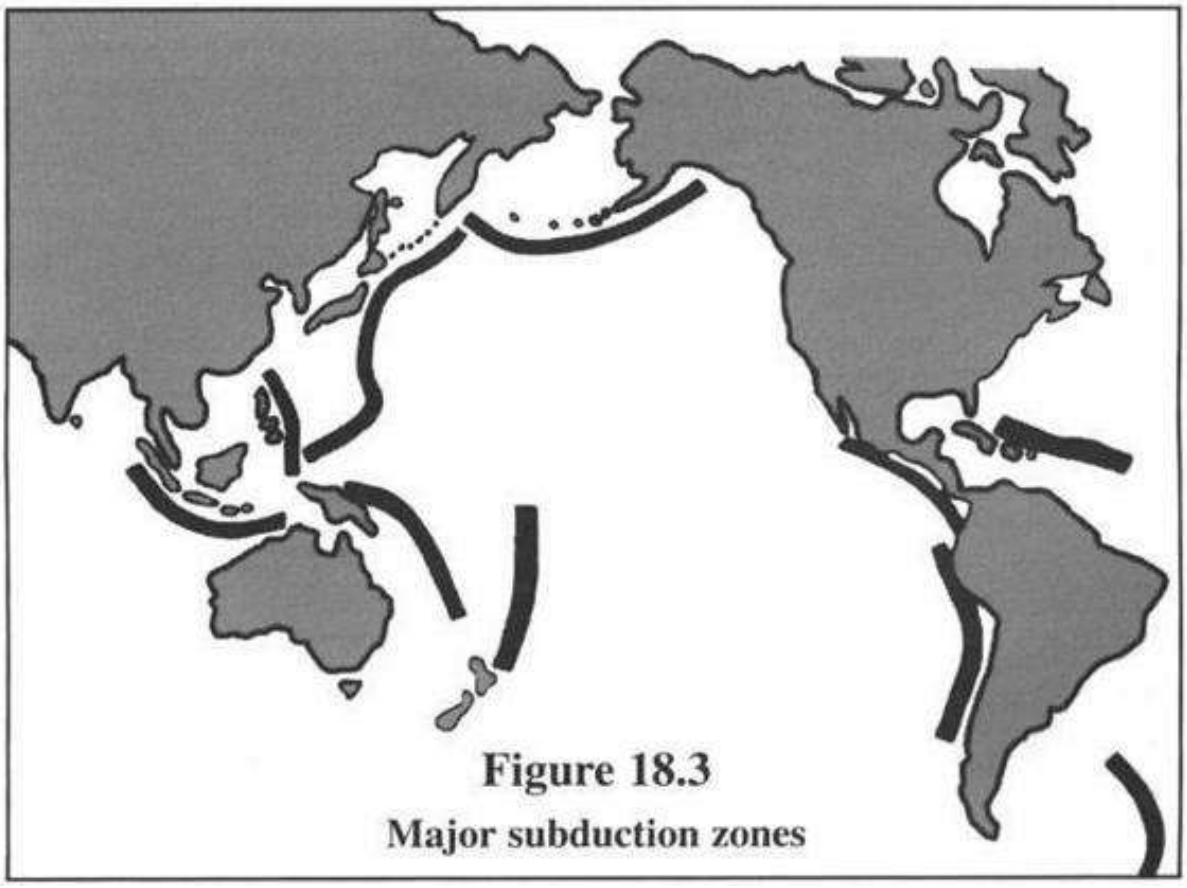

Figure 18.3
Major subduction zones

> . . . such examples indicate that the idea of subduction was taken into the literature without rigorous check, and is not maintainable as a geotectonic phenomenon.[25]

The Meyerhoff's pointed to the "Africa paradox" problem. An ocean-floor-spreading rift zone surrounds Africa. It is shaped like an inflated caricature of Africa, and is more than twice the size of the African continent. The Meyerhoffs state that:

> Somewhere within Africa, plate theory demands a sink which has swallowed an area of crust lithosphere greater than the whole of Africa. Where is it? Such just does not exist!

In fact the very opposite of this is happening inside Africa. The great rift valley system is itself a spreading ridge which lies between the Indian and Atlantic Ocean ridges.[26]

The Africa paradox is part of a more general problem: the apparent

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absence of subduction zones in some places we would expect to find them and the lack of sediments at these zones.

CONTINENTAL JIGSAW PUZZLES

Among the strongest evidence in favor of Plate Tectonics are the fitting coastlines of the continents. The most obvious “fit” which one sees on a map of the world is that between South America and Africa. Scientists tend to describe these continental fits as “compelling.” But what happens when you find a fit between coastlines which could never have been next to each other?

In 1972 Paul S. Wesson conducted such an exercise. He noted that nearly all coast lines fit and that this devalues the process of continental drift reconstructions. Another scientist, Lyustikh also demonstrated the congruence of coastlines which could never have been next to each other. Voisey connected the east coast of America to Australia as a demonstration of how easy it is to find improbable continental fits. Wesson noted that coastlines need never have been in physical contact with each other to show parallelism. He suggested that perhaps some influence connected with the mid-ocean ridges might give the impression of a real fit when in fact there is none.[27] Note the we ll matching continental shelf in Figure 18.4.

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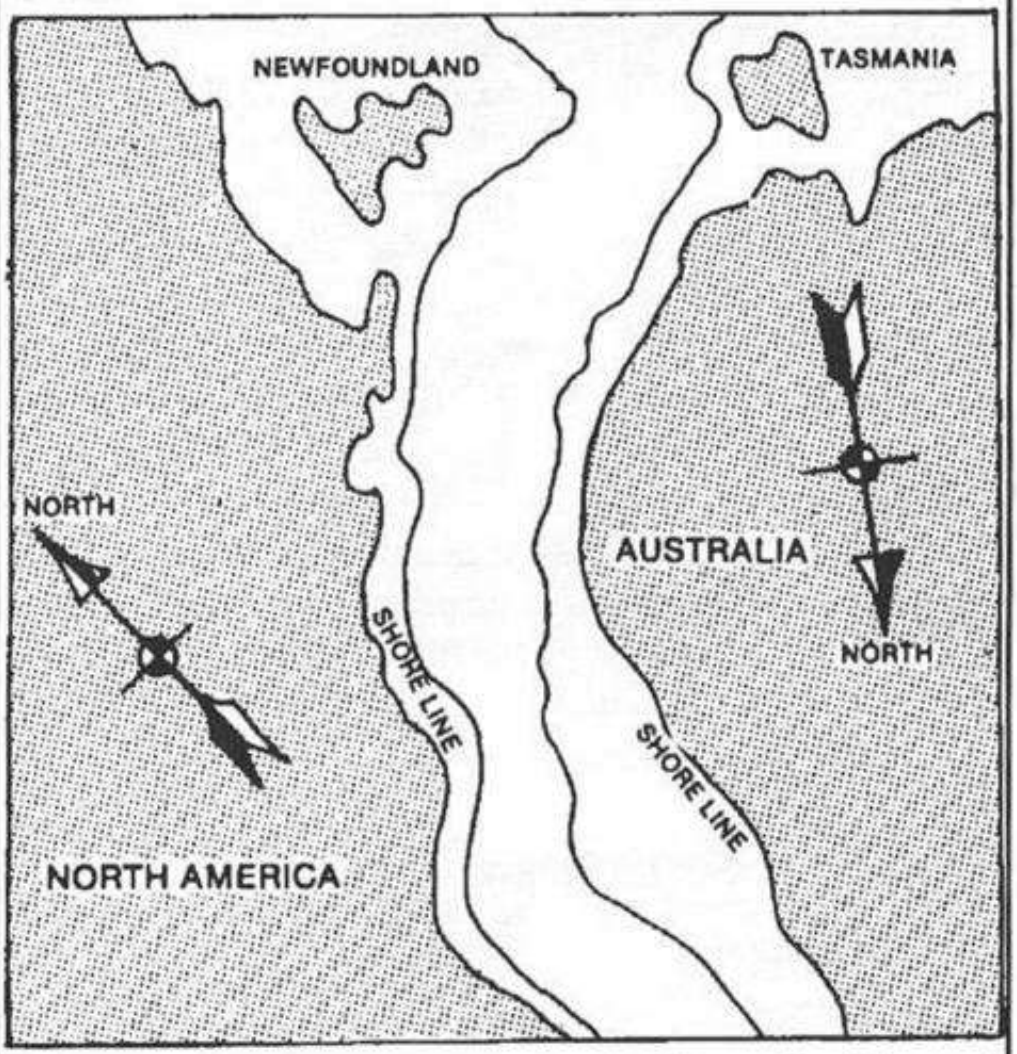
Figure 18.4

Reproduced by permission from The University of Chicago Press. Credit: Wesson, Paul S.; "Objections to Continental Drift and Plate Tectonics," *Journal of Geology*, 82:185, 1972.



When rotated, eastern Australia fits well with eastern North America—an improbable "good fit."

With regard to the fit between South America and Africa I would like to

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point to an interesting irony. It has been found that the continental fits are much better when one assumes a smaller Earth which is only 80% the diameter of the Earth today! This is another reason why some geologists believe the Earth has expanded. None of this helps Plate Tectonics does it?[28]

The Meyerhoff's also challenged the "compelling" continental fits. In a detailed 77 page critique they pointed out the many short comings of continental drift. They pointed out that there are overlaps as well as missing pieces. They noted that the Bullard *et al.* fit looks good surficially, but they were concerned by an overlap of 100–300 km between South America and Africa; North America and Europe and also between Antarctica and Australia. With regard to Smith's fits they comment:

> The alleged 'fits' worked out by Smith for various islands and peninsulas of the modern Mediterranean Sea do more than simply boggle the mind; **they violate the geology— absolutely. The least-squares fitting method is fine for working out a mathematical curve, but it has serious shortcomings where solid rocks are involved**.

They point out that there are areas in Latin America, Cuba and Florida missing from the Bullard *et al.*fit (See Figure 18.5)—an area which covers 2.4 million km^2. They also note that in some reconstructions Spain was rotated, and that this is contrary to the geological evidence which demonstrates conclusively that Spain never rotated. The Nafe and Drake model suggested the existence of a Paleozoic proto-Atlantic Ocean. This however is unnecessary if the positions of the continents have never changed. The Meyerhoff's lamented the need for superfluous hypotheses such as those mentioned above which were needed to make the fits credible.[29]

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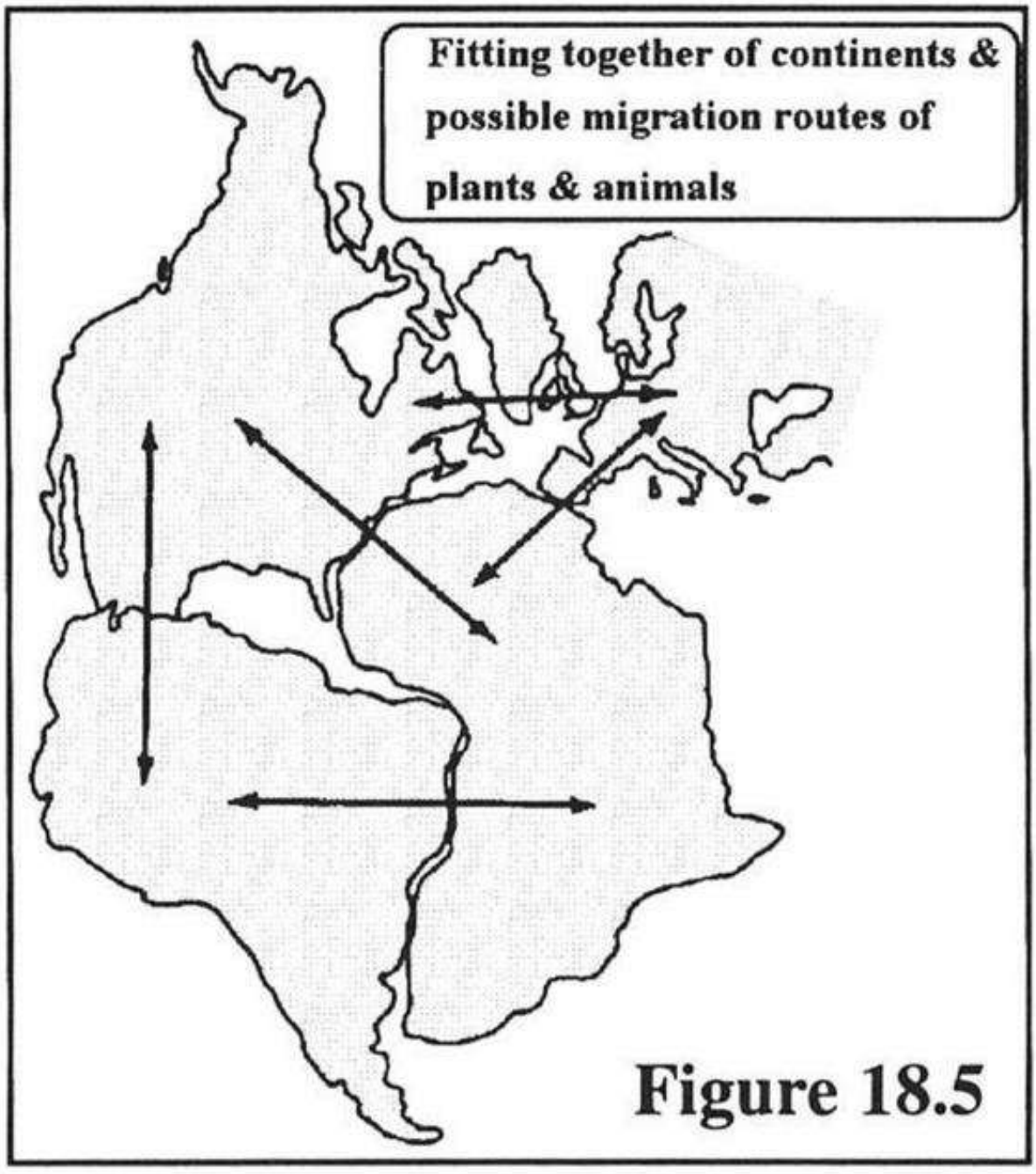

Figure 18.5

As can be seen in Figure 18.5, Latin America has been removed from the map and Europe seems to be the odd man out. H. G. Owen was another opponent of the idea. His objections were also numerous and detailed. He too was concerned by the Bullard fit and the Smith–Hallam fit which resulted in overlaps and misfits which are not easily explained. He pointed out that many geologists were worried by the loss of central America in the Bullard fit. Yet, this region contained extensive areas of old continental rocks. The

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explanations for this seemed to be arbitrary, ad hoc and lacked credibility. West Antarctica did not run into its obvious geological continuation in Patagonia in the Smith–Hallam fit. He was especially disturbed by a large gap west of Australia which had led to the suggestion that the Wharton basin was an ancient ocean. But this had been disproved by deep sea drilling which showed that the oceanic crust underneath it is as young as elsewhere. Finally, he pointed to the India problem. When one fits India against Australia (as many have done) it then leaves a gap in the western Indian Ocean.[30]

India presents an especially tricky problem to Plate Tectonicists. It has close faunal and paleographic ties with Antarctica, Arabia, Australia, Afghanistan, Kazakhstan, Tibet, East Africa, Madagascar and Iran. This places continental drift in a quandary because how does one account for all of these connections? India is just not large enough to be connected to all these places at the same time. As S. W. Carey noted:

> . . . it is impossible to satisfy the valid proximity demands of one insistent neighbor without leaving wide blank spaces between India and others whose proximity demands are equally compelling.[31]

EXPANDING PLANETS

The Expanding Earth theory has been supported by some geologists, most notably S. W. Carey of the University of Tasmania. The essence of their argument is that the Earth is currently expanding. According to Plate Tectonics there should be a “conveyor belt” of matter coming up from the mid-ocean ridges while matter is being pushed down into the Earth at the continental plates by way of subduction. Carey and his supporters question the existence of subduction—with good reason. They then supply various evidence to show that the Earth is slowly expanding. They cannot however supply us with a mechanism by which this is done, because it would require considerable energy.

Expanding Earth theory serves to indicate how complex geology is, and how dynamic this planet is. The idea is supported by a small core of geologists, of which S. W. Carey is the main champion. Their views are interesting, and it is fascinating to see these scientists throwing cold water over all of Plate Tectonics through the use of a number of arguments, some of them highly technical. It again demonstrates the sheer difficulty of making

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sense of the history of our planet. One can therefore appreciate the difficulty of the problem which scientists are trying to solve. My only criticism is the narrow focus of theory and research. I think that groups like Carey's crowd add some real alternative thinking into the melting pot of ideas, which can only be good.

As with all new ideas, there is some dissension regarding the exact extent of the Earth's expansion. In 1979 W. B. Harland added his own thoughts to the melting pot. He pointed out that through the use of magnetic striping scientists have mapped ocean spreading with considerable precision. A much more difficult problem has been to estimate how much of this new crust was subducted. Harland referred to the work of H. G. Owen of the British Museum who plotted the striping in a series of detailed maps. The result showed that the Earth should have expanded by a more modest, yet significant amount than that supposed by S. W. Carey. The reason Owen's expansion is less than Carey's is because he recognizes the evidence of subduction zones. Harland makes a point of considerable importance:

> It might be added that most plate tectonic reconstructions seem to get by with a steady size Earth but they generally do not plot ocean floor spreading details. In this respect Owen's work is so thorough that it cannot be ignored.[32]

My assessment of the evidence leads me to suggest the following:

1. That Carey, Owen and Harland are probably correct in stating that the Earth is currently expanding because their evidence seems strong.
2. They may be partly right in questioning subduction. Subduction does seem to be a feature of mainly in the Pacific and barely exists anywhere else.
3. I think they are wrong in assuming that just because the Earth is currently expanding that it will continue to expand ad infinitum. It may be cyclic. Perhaps it is related to the weakening of the Earth's magnetic which in turn may be changing the value of G deep inside the Earth? Could this be causing a temporary expansion of the Earth which may be reversed later?

I think that if the Earth did ever expand then it was a one-time affair long

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ago, either because of a nuclear Inner Sun or as a normal result of gravity on a spinning planet. One geologist I chatted to told me that he thought that the Earth expanded—as a one-time affair. I don't think we can rule out the possibility that the current expansion may just be a temporary adjustment due to forces operating inside the Earth's crust. There may be a redistribution of mass going on inside the Earth which is totally unrecognized by science. Nevertheless, all this talk of expansion (and perhaps subsequent contraction) is contrary to plate tectonic theory.

PLATE TECTONICS ENERGY

Continents do not float about aimlessly on a molten ocean as many suppose. The continents are heavy and the resistance to motion is considerable. The movement of the continents actually requires a great deal of energy. Where does the energy come from to fuel this process?

It was once thought that the Earth was cooling down as it lost the heat from its molten interior. We now know that the Earth's temperature is roughly constant because heat is generated within the crust through the decay of radioactive materials. Richard Milton, a science writer, pointed out that "the continental drift mechanism must not disturb this heat balance." He cites the work of Melvin Cook whose detailed studies of the most promising continental drift models showed that they are incapable of providing the required energies.

Most scientists think that continental drift is due to convection currents in the mantle. The mantle is seen as behaving something like semi-molten iron which rises because of heat, forming a convection current, and then sinking when it cools down. The continents can be thought of as a solid slag which floats on top. It is thought that the energy which drives continental drift comes from the friction between the base of the continents and the convection currents.

Melvin Cook did a study to see how much energy would be needed in the mantle to drive a convection process powerful enough to move the continents. He found that the mantle would need to generate approximately 10–1,000 billion times as much heat as the radiogenic heat which is currently generated in the crust as a whole. Cook stated:

Clearly, such currents are impossible because either they would melt the

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Earth in a very short time, or one would observe an enormously greater heat flux from the Earth than is actually observed.

Plate tectonic theory brings another problem with it. It supposes that once upon a time the entire Earth was covered in a single continent. This continent was supposed to have been broken apart due to the convection currents which began continental drift. The energy needed to break up this continent is considerably more than that needed to move them. For all this to be workable the mantle needs a high viscosity and the convection currents need to travel at a reasonable speed as well, so that the necessary energy is imparted to the bases of the continents. According to Richard Milton, for this to be workable it has been found that the viscosity of the mantle needs to be 100 million times greater than that which is currently postulated.[33]

Melvin Cook points out that the continents do not wander aimlessly about the Earth's surface. Exceptionally strong forces need to be applied to them to move them. When they do move, it is with a force which is powerful enough to plastically deform and fracture rocks of the greatest strength. Such a process cannot occur uniformly but only in sudden explosive manner. Cook tried to develop a non-uniformitarian model. He tested the suggestion of Prof. Hapgood and Campbell to see if the thickening ice caps could create the necessary stresses. In Cook's model, the super-continent, Pangea, stretched from pole to pole. He found that the build-up of ice at one or both poles was enough to snap the crust. The resultant fracture would occur very rapidly. It should be remembered that Wisconsin in the USA, used to lie in the ancient arctic. The Wisconsin ice cap suddenly disappeared about 10,000 years ago. The ice cap had a mass of about 100 million billion tons. Cook points out that this ice cap would have taken 30,000 years (under the most ideal conditions) to melt. In order to account for the persistence of the Wisconsin depression, Cook notes that one has to conclude that the ice was dissipated catastrophically.[34]

Did the super-continent ever really exist? There are two possibilities. If it really did exist it might have been broken apart by the weight of an ice cap as Melvin Cook suggests. That is one possibility. But I truly question whether a super-continent ever existed.

At the beginning of this chapter I mentioned the problem of erosion and I seriously question whether continents can be permanent. Ovid (43 BC–18 AD), made a similar observation 2,000 years ago: "Time: the devourer of all

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things.” Gravity is a vertical force which acts permanently across the surface of the Earth. Weather in the form of wind, rain and waves constitute a horizontal force which is always at work breaking up land which lies above the sea floor. Any land above the seabed is essentially unstable (because of these forces acting on it). The Earth should consist of layers of varying density, but in reality it is not. The continents constitute an exception to this rule.

As has been seen in this chapter, I propose that it is more likely that land rose and fell than it is that it moved. The idea of a super-continent is based on the idea that parts of various continents are “related.” Some of this might be valid, produced by enormous earthquakes perhaps. However, I seriously doubt that continents actually move enormous distances across the Earth’s surface. I think that erosive forces deep inside a Hollow Planet probably drive the entire process of rising and falling land—and earthquakes to begin with. The apparent movement of the continents over large distances might be achieved in the same way that motion pictures work. Earthquakes might work like the individual frames of a movie. One might have a series of earthquakes which extend a continent over a period of time, while the older parts of it erode away (or are also destroyed by subsidence). In this way, there is a continuity for land life, and land life migrates over time to inhabit the new land as the old erodes away. Eventually, one may have two continents far apart which share similar flora and fauna—giving the appearance of motion. In fact, perhaps they both originated from another even old continent which has by now been thoroughly destroyed, whose remains are now nothing but sediments on the sea floor. Earlier I mentioned the possibility of subsidence of large parts of the Earth’s crust. One should not underestimate the power of nature to perhaps destroy a continent so completely that there is not one shred of evidence remaining that such a continent ever existed. If that ever happened then much of uniformitarian geology would be redundant.

As I write this, there has been news every day of storms in California. Incessant rain, wind and waves have been battering the Californian coastline. In a mere matter of weeks which translates into a millionth of a “nanosecond” of geologic time, entire cliff faces have been destroyed, and yards upon yards of land (including people’s homes), have been washed into the sea. All this has happened in under two months—rather than millions of years. Parts of the coast of the British Isles are eroded away at up to 7 yrd/yr. Here in South Africa it is no different. We live in a semi-arid country with low rainfall, so

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erosion (being a function of rainfall) should be low. Even so, I noted on CNN that approximately 40 million tons of top soil from South Africa ends up in the oceans each year. But show me one statistic which shows, even 0.1% of that amount of soil being replaced by nature alone? There is no such thing. In Zimbabwe, where the rainfall is much higher, erosion is a major problem and farmers who do not take care of their land can have enormous gullies eroded away in just a few years. Rivers like the Mississippi and the Amazon wash enormous amounts of soil into the ocean each year—soil which is irreplaceable. Governments around the world have programs to combat the erosion of their coastlines. Why do we worry so much about the effects of erosion when scientists tell us that nature is busy replacing the land and that continents are permanent? The bottom line is that I fail to see how continents can be regarded as permanent features.

Water from Lake Erie pours into the Niagara river at the tremendous rate of 202,000 cubic ft/sec, three quarters of which is used for hydro-electricity. The Niagara Falls are not old at all. In geologic terms all rivers are very young. The Niagara Falls are thought to be about 12,000 years old. The Falls originally stood 7 mi north of their present location. This is the result of 12,000 years of erosion.[35]

In 1984, John Maddox, the editor of *Nature* voiced his own concerns about the reality of convection currents in the mantle. He pointed out that the convection cells in the mantle must have persisted for at least 180 million years (the age of the oldest rocks found in the oceanic crust). Maddox then says:

> So one would expect that the outlines of these convection cells would by now have been fully described, and the outlines of their ascending and descending walls drawn out on maps as befits important influences on the surface structure of the Earth.[36]

But such maps do not exist. No one has as yet found the places where these cells are slowly rising or descending and no such pattern can be seen. So it makes one wonder if Plate Tectonics is really a figment of the scientific imagination?

CONCLUSION

Being an unconventional thinker by nature, I have long thought that the

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geological evidence was ambiguous and that it also had missing pieces to it. If this is so, then Plate Tectonics might collapse in a heap should new facts come to light.

My study was aimed at determining the scientific validity of an old idea. I felt it necessary to take a pot-shot at seeing how a crazy old idea would hold up in areas where geology is strong and is currently able to explain the facts. It was natural to therefore attempt to pit it against something as well established as Plate Tectonics. The result of this theoretical attempt has been this part of the book which I have called “Beyond Plate Tectonics.” I could easily have left this out, but decided not to. I want to show the Reader that Plate Tectonics does not have all the evidence to itself. Today most scientists consider Plate Tectonics to be the absolute truth and to be totally unassailable. But, as can be seen, there are potential problems with it and I was quite surprised at how Hollow Planet theory could explain many things where people think Plate Tectonics has a total monopoly of the explanations.

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Chapter 19: Pole Shift

In this chapter we will explore the Pole Shift concept as opposed to the concept of continental drift. Did continents move or did our planet as a whole tilt over at various points in its history?

Prof. Charles Hapgood is the originator of the Pole Shift idea. Albert Einstein was very impressed with his ideas. Hapgood looked at the current model of the Earth and wondered what would happen if ice continued accumulating at the poles indefinitely. The ice caps in Greenland and Antarctica are accumulating ice constantly. The rate of accumulation is slow, but the ice never melts. Ice has considerable weight and can crush a continent beneath it. Hapgood noted that the accumulation of ice in both hemispheres was uneven. This meant that centrifugal forces were generated which might push the Earth over to one side (i.e. cause it to tilt). Hapgood based his arguments on the current model of the solid Earth. He theorized that this sideways force would eventually overcome the frictional forces between the Earth's crust and the mantle. Once slippage begins and friction is overcome a very high speed "continental drift" would set in as the polar regions rush towards the equator (at a speed of hundreds of miles an hour!). Hapgood's model is slightly unrealistic (in my opinion) because virtually everything is destroyed on the face of the Earth as the entire crust flips 90 degrees about two equatorial points. Hapgood's ideas may well be correct if the Earth is indeed solid and is structured the way scientists currently think. However, if the Earth were a hollow, rigid shell, then the Pole Shift scenario might not be nearly as destructive as Hapgood envisioned. One might instead get a gentle tilting of the planet. A Pole Shift would indeed be the ultimate experiment to determine if the Earth were solid or not. A gentle tilting would demonstrate that the crustal slippage which Hapgood expected does not occur. A gentle tilting would demonstrate that the planet is really rigid. This does not mean that a Pole Shift on a Hollow Planet would be a mild experience. It may be accompanied by considerable seismic activity as the Earth readjusts itself.

Nevertheless, Hapgood's basic idea is sound. Ice continues accumulating in Antarctica at a rate of about 2 ft/yr. In 1960 Pyotr Shumsky, the Russian IGY chief announced that the volume of Antarctic ice is accumulating at a rate of approximately 293mi^2/yr. The total annual snowfall

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is estimated to be 612 cubic miles but much of this is blown out to sea. When all the factors are taken into account (e.g. melting, evaporation, breaking off of icebergs, etc) the Antarctic ice cap is growing by approximately 300 mi^3/yr. Scientists have estimated that the incredible weight of this ice cap has caused the continent beneath it to be pushed down by 1,600–3,300 feet. Since the ice doesn't melt something may give way at some point.[1]

The main mechanism proposed for Pole Shifts has always been the offset and uneven ice caps. Antarctica is uneven in its land distribution around the South Pole. And in the northern hemisphere the only permanent ice cap is that on Greenland. Greenland lies at quite a distance from the North Pole and there is no corresponding ice cap in Russia to make up for the weight of the ice in Greenland. This is similar to having an unbalanced wheel on one's car. The centrifugal forces acting at right angles to the Earth's rotation are therefore uneven. A second consequence of this is that the stresses are directed towards the equator. Antarctica has no seismic activity, but it is surrounded by a ring of seismic activity. Could any of this be due to the mass of the ice cap?

In Plate 33 the Reader will see a map produced by satellite. This map shows the general height of both land and ice across the world. One does not normally see this sort of comparison in an atlas. The red shows heights approximately above 10,000 ft. Look at Greenland and Antarctica, pure red in color, compared to other major mountain chains. Compare the height of the Rocky mountains in the Western USA and the Himalayas with the polar ice caps. Antarctica is the highest continent on Earth, once you're standing on top of all that ice! The average continent has a height of 5,000 ft above sea level. Greenland has an average height of 10,000 ft above sea level, and Antarctica is a staggering 14,000 ft above sea level or half the height of Mount Everest! In this map the polar regions are of course exaggerated in size.

In the Hollow Planet scenario we need not worry about continents racing towards the equator at hundreds of miles an hour. Hapgood's scenario is violent enough to annihilate all life on the Earth, virtually, especially land life. The fact that life has persisted for so long on this planet suggests to me that Hapgood's violent scenario has never really been played out. A Pole Shift on a Hollow Planet might trigger violent earthquakes in the process and perhaps some land might rise from the seabed, and other land might sink.

Ice ages pose a fascinating problem to the current reigning paradigm.

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The extremely slow motion of the continents (as per Plate Tectonics) is far too slow to account for the climatic changes in the vast areas where there is evidence of Ice Ages. The term “Ice Age” might well be a misnomer. In order to account for these “Ice Ages”, scientists inform us that for some reason (which no one quite knows), “Ice Ages” seem to descend regularly upon the Earth. The climate is said to be the culprit. Some scientists have spoken in terms of changes in the Earth’s orbit as being the cause. Conceptually, this is a stone’s throw away from admitting that the Earth itself might have moved in its orientation towards the Sun. Do Ice ages really occur in the manner that scientists propose? Or are they perhaps misinterpretations of past Pole Shifts?

If the Earth has a far lesser mass than we suppose then the ratio of the mass of the ice with respect to the mass of the entire Earth is far greater than is currently supposed. This would imply that a Pole Shift due to mass redistribution may be far more likely than scientists currently suppose.

Another possibility which I would like to propose is that deep inside the Earth’s crust, the matter might not nearly be as compressed as has been believed. There may be cavities deep inside the Earth which we know nothing of, and perhaps new ones are created as water moves around inside the crust. As the heavy polar ice presses down upon the Earth, there may come a time where some of these cavities collapse. What if a large cavity collapses—a cavity perhaps created by a veritable ocean of water? Could this cause a continent or a mountain chain on the surface of the Earth to then subside? With Plate Tectonics, this would be a heresy. But on a Hollow Planet one might find such concepts to be quite possible.

The entire problem boils down to one of mechanical stresses. Perhaps Antarctica and Greenland play a large part in the seismic activity of the Earth? Not that they need to be seismically active. Not at all. But the pressure that they exert on surrounding regions may cause quakes elsewhere, far away from them - yet the stresses may originates from them. Distance is not the issue as much as the sideways and downward forces exerted by the Polar caps. Antarctica is actually seismically inactive. The only real “seismic” activity being ice quakes caused by ice being packed in ever more tightly as more ice falls on top.

P. Hedervari has this to say about Antarctica:

> Antarctica, disregarding the small volcanic earthquakes that accompany the eruptions of volcanoes, is actually an aseismic land, as far as tectonic

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> shocks are concerned. **It is, however, surrounded by an almost continuous ring of tectonic earthquakes; but these shocks do not belong to Antarctica itself.**[2]

Could this continuous ring of quakes around Antarctica be due to the pressures exerted by the weight of the polar ice cap?

BIOLOGICAL EXTINCTIONS

These days it is fashionable to state that biological extinctions are caused by comet or meteor strikes. Yet not too long ago, even those ideas were bitterly opposed by the gradualists in the scientific community. Now that planetary disasters are more acceptable to all, perhaps we should explore the possibility of Pole Shifts as the destroyers of life, not as violently as Hapgood envisaged, but nevertheless terrifying. What if some of these biological extinctions attributed to comets exhibited a cyclical pattern? If some of them do, then it would be an argument against the idea that all biological extinctions are caused by comet or meteor strikes. Comets or meteors could not be expected to show a cyclical pattern. It would be absurd to expect comets to strike the Earth at regular intervals. Each comet or meteor that hits the Earth is one comet or meteor less. To then expect a cyclical pattern caused by this is to be entirely unreasonable. Of course, it might point to some other (undefined) astronomical event—but so far there are no other candidates to consider.

I am not saying that comet and meteor strikes never happened. Sure, some of the biological extinctions which took place may well have been caused by a strike by an extraterrestrial body. However, there have been a considerable number biological extinctions in the Earth's history. Some of these do exhibit a certain cyclical nature and it is these which we are interested in. The purpose here is to show the Reader that enormous changes might take place regularly across the face of the Earth, changes on an enormous scale, changes of a catastrophic nature which destroy large numbers of living creatures. Some of these enormous changes may be caused by Pole Shifts of our possibly Hollow Planet. Let us examine some of the evidence for this.

In 1983, C. Simon mentioned the possibility that there might be a pattern to past mass extinctions. He cited the work of John Sepkoski of the

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University of Chicago. Sepkoski had gone to great lengths to compile detailed records of when certain families of marine organisms vanished from the fossil record. David Raup, from the same university, then proceeded to draw graphs based on this data. Simon writes:

> A curious pattern emerged, one that scientists could neither explain nor ignore. Roughly every 26 million years for the last 250 million years, the numbers of extinctions jumped above the background of extinctions that occur in the normal course of life.

Until then, it had been widely believed by scientists that mass extinctions were random events. Instead it appeared that at regular intervals something perturbs the biological system, not destroying it, but resetting it so powerfully that the ensuing changes forever twist the course of evolution.[3]

There were of course criticisms of these ideas. Raup and Sepkoski responded to these criticisms with an article in *Science* in 1986. By analyzing eight biological extinction events involving marine families, they confirmed their original periodicity of 26 million years.[4]

There were further criticisms after the second article, and this stimulated Raup to amass even more data. Later D. Raup and G. Boyajian presented the results of an analysis of the fossil record showing the growth and decline of 20,000 marine genera over a period of 100 million years. These results can be seen in Figure 19.1 which is a graph of ten groups (totalling 1,000 genera). L. Roger commented on this graph and made two points:

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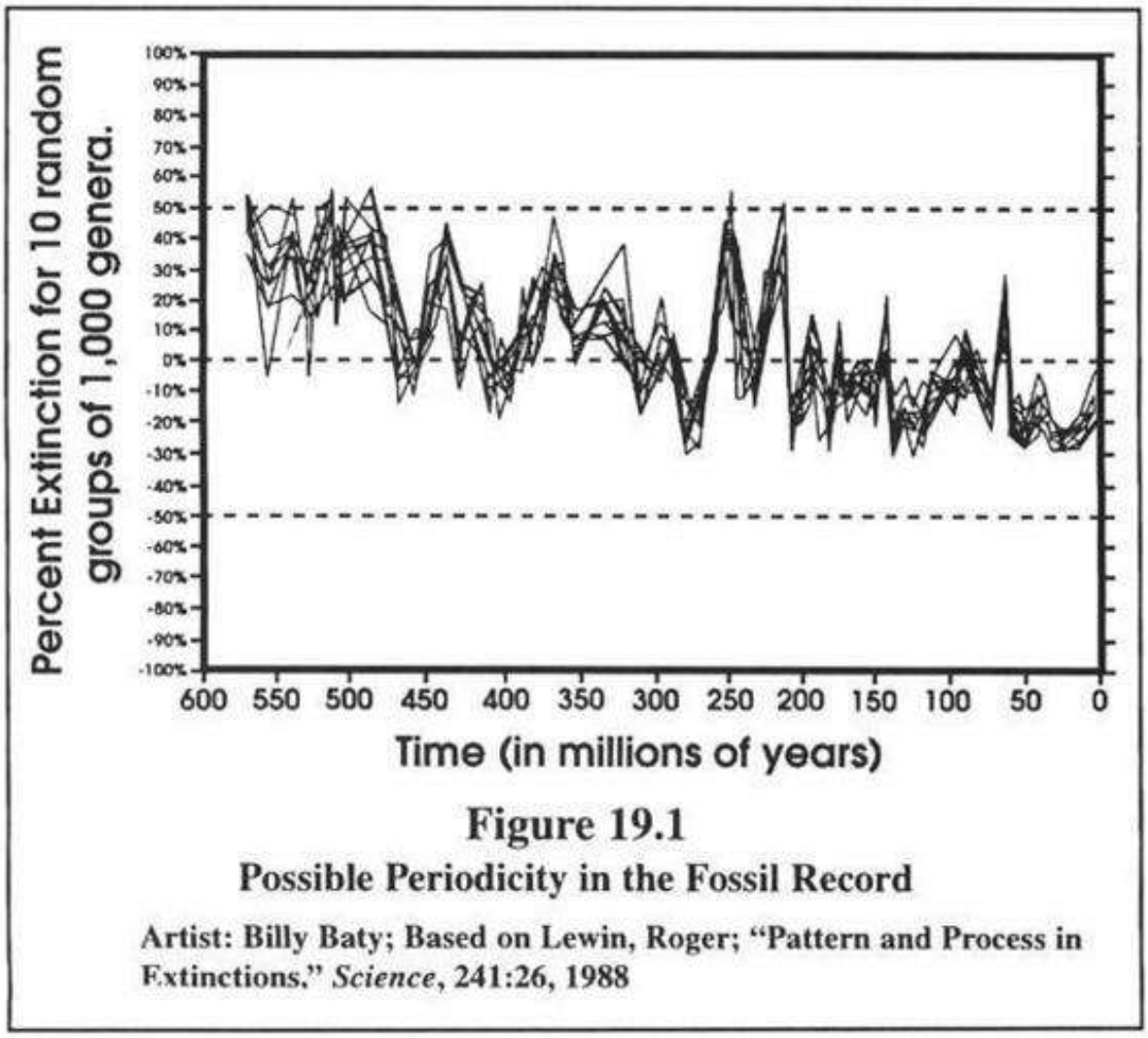

Figure 19.1

Possible Periodicity in the Fossil Record

Artist: Billy Baty; Based on Lewin, Roger; "Pattern and Process in Extinctions," *Science*, 241:26, 1988

1. Raup and Boyajian pose the following question:

> Does the fossil record of extinction in the Phanerozoic show a consistent, repeatable pattern, or is it a confused amalgam of signals produced by many independent evolutionary histories? [Their results show that] the strongest component of the pattern is uniformity of response across different groups.

Scientists expected extinctions to be selective, and for each species to die out as a result of selective evolutionary factors. Raup and Boyajian disagree. A clear pattern becomes discernible when one studies their graph.

2. Raup and Boyajian stated that:

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> We have extinction events that cut across functional, physiological, and ecological lines, **and this suggests common external causes. In other words, the results suggest that extinction is physically rather than biologically driven**.

Both Raup and Boyajian do not know what causes these extinctions, but they did note that regardless of the cause, the "major pulses of extinction result from geographically pervasive environmental disturbances."[5]

The Reader should take note of (2) above. The extinctions are massive and affect many species, implying a major physical catastrophe capable of destroying a wide range of life.

MAGNETIC REVERSALS

D. E. Loper wondered if the Earth itself was the cause of extinctions and other possibly related phenomenon. Loper noticed that there was a frequent correlation between mass extinctions; magnetic field reversals; climatic changes and various geological phenomenon. Loper wondered if this was related to cyclic activity within the Earth's core and mantle. He attempted to explain these cycles in terms of events deep inside the Earth which might produce carbon dioxide and various sulfates which would affect animal and plant life and also the climate.

Since the early 1960s some scientists have noticed that there might be a correlation between the fossil record and the geomagnetic signatures in the same rock formations. This has raised two important questions:

1. Are the correlations strong enough to imply a causal relationship? (i.e. Is the evidence strong enough to suggest a that there is a link?)
2. Is there a reasonable causal connection? (direct or indirect?).

One of the earliest correlations discovered by scientists was one where radiolarian extinctions in the southern ocean were linked to geomagnetic reversals over the past 10 million years.

In 1977, Martin Whyte pointed out that this pattern seemed to be much wider than was previously thought. There seemed to be a correlation between:

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1. Climate.
2. Sea level.
3. The amount of activity at the mid-ocean ridges.
4. The Earth's rate of rotation.
5. The polarity bias of the geomagnetic field.

Whyte noticed that these 5 variables seemed to change in concert with each other during the last 450 million years. He noted that when all these variables suddenly reversed themselves at the same time, that it then led to "climatic instabilities" which then "disrupted the biological ecosystems and led to mass extinctions."[6] One has to ask oneself how so many different factors could all be related together? How is it that all these variables change in concert with each other? It seems to me that a Pole Shift is a very reasonable possibility. Let us examine some more evidence.

J. P. Kennett and N. D. Watkins wrote:

> Studies of deep sea sedimentary cores from Antarctic Pacific waters show that **some volcanic maxima occurred when the geomagnetic polarity was changing. Upper mantle activity and geomagnetic polarity change may therefore be related**.

They noted that there were "coincidences" between:

1. Geomagnetic polarity changes (magnetic reversals).
2. Faunal extinctions.
3. Climatic changes.
4. Volcanic activity.

They explained the extinctions and the magnetic reversals as being caused by volcanic activity which then caused a corresponding change in climate.[7] But why should volcanic activity recur at intervals? Could the volcanic activity have been caused by a Pole Shift and a weight redistribution?

Eight species of radiolaria have become extinct during the last 2.5 million years. A study of deep sea cores from high and low latitudes revealed that prior to their extinction these species were widely distributed. J. D. Hays noted that:

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> [They] became extinct isochronously throughout their geographic range. **Six of the eight species disappeared in close proximity to magnetic reversals recorded in the sediment**.[8]

David Raup was mentioned earlier in this chapter. He thought that there seemed to be a cyclic pattern to mass biological extinctions. In 1985 he wrote a paper in which he tried to demonstrate a possible link between reversals of the magnetic field and extinctions. He had noticed that the geomagnetic field seems to undergo reversals approximately every 30 million years. These reversals had occurred 10, 40, 70. . . million years ago. Raup wrote: "Biological extinctions are correlated with some of these reversals."[9] My question is whether geomagnetic reversals, Pole Shift and biological extinctions are perhaps all interrelated? Couldn't a Pole Shift perhaps be the primary causative mechanism which produces all these other observed effects? (e.g. volcanic activity, mass extinctions, geomagnetic reversals, etc?) Let me point the Reader to a very strange coincidence which is in support of much of the theme of this book. Note how surface events (e.g. climate change and mass extinctions) are related to activities in the Earth's core—like the geomagnetic reversals. How can all these things be related? My suggestion is that perhaps activity deep inside the planet causes a Pole Shift and all the attendant phenomenon which one sees.

Goesta Wollin was also mentioned earlier in this book. He began his strange line of enquiry as a result of impressive correlations which he saw between geomagnetism and the climate. He studied many deep sea cores (mainly from the Pacific and Caribbean), but also from other sites. He was able to compile records of magnetic intensity and inclination as well as temperature from these cores. He deduced the temperature by studying foraminifera shells as well as oxygen-isotope ratios. He found that the stronger magnetic intensity of the last 500,000 years could be linked to the colder climates experienced during this time. J. D. Hays voiced the opinion that "Explaining this correlation is difficult."[10]

Another scientist, R. W. Fairbridge also studied the possible correlations between magnetic reversals (also called excursions) and climate. He was especially interested in the Gothenburg excursion which occurred 13,500 BP (Before Present). Fairbridge found that several dramatic events occurred at the same time as the reversal:

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1. A tremendous increase in the discharge of the river Nile.
2. A sudden re-advance of the great Laurentian ice sheet.
3. A fall in the sea level.
4. There was a short reversal of the climatic warming trend that was underway at the time.

Fairbridge even remarked that the demise of Neanderthal man might perhaps be correlated with the Gothenburg excursion. Fairbridge thought that these correlations were related to the Milankovitch cycle of climate changes which is caused by changes in the Earth's orbit.[11] Most of the things events which Fairbridge found point to the beginning of an ice age (e.g. fall in sea level due to water being frozen). The exception is the increase in the discharge of the Nile. Nevertheless, how can magnetism inside the Earth affect so many surface variables?

Christopher Doake of the British Antarctic Survey conducted a statistical survey and found additional evidence suggesting that there is a connection between geomagnetic excursions and climate change. He used changes in microfauna and oxygen isotopes within an ocean core as his indicators. Doake reported that climatic indicators in New Zealand show a "significant correlation" with magnetic field reversals.[12] Doake concludes that ". . . if a simple probability model holds there is apparently **a probability of about 0.4 that a climatic event will cause a magnetic field reversal."**[13] In this case, Doake is saying things the other way around. He is saying that a climatic event may cause a geomagnetic field reversal. But how? There is a cause and effect problem here. Which is the cause and which is the effect? Or is there something else which causes both of them?

That is what David Loper and his colleague's suggested in 1988: "The ultimate forcing phenomenon, however, is probably neither the climate nor the reversals." He suggested that perhaps the Earth underwent periodic changes in its generation of heat. Or, perhaps a change in the circulation of the core was the cause or either or both climate changes and magnetic reversals. This was a very contrary suggestion at a time when most scientists favored the asteroid/comet impact hypothesis as the major mechanism for mass extinctions. But they were not alone. V. E. Courtillot was another proponent of volcanism as an explanation for mass biological extinctions.

Loper *et al.*had reviewed the possible correlations which suggested that volcanic activity; mass extinctions and magnetic reversals might be periodic

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or episodic nature. They did not find the evidence to be convincing especially that relating to volcanic activity. Even so, they concluded:

> **There is a strong indication that such correlations may be genuine. Assuming this to be the case, we have argued that the correlations are due to an internal,** rather than an external cause. . .[14]

M. A. Whyte tried to relate all these factors to changes in the rate of the Earth's rotation (moment of inertia). If one sits back and thinks about the possible effects of a Pole Shift and the resultant mass redistribution in the Earth then it is possible that it might slightly affect the rate of the Earth's rotation. For example, suppose the Earth tilts by a few degrees. The ice caps might then melt thereby raising the sea level world wide.

Collapsing cavities inside the Earth and perhaps the motion of water deep inside the Earth might then also affect the Earth's rotation. Perhaps it will speed up slightly or slow down slightly. So it is conceivable that along with all the other factors (mass extinctions, volcanism, etc), one may also have a change in the Earth's moment of inertia. But again, which is the cause and which is the effect?

Whyte tried to tie together the rate of the Earth's rotation with the polarity of the magnetic field; the level of activity at the mid-ocean ridges; climate and sea level. Whyte concluded that these simultaneous changes in these variables probably caused the mass extinctions. And like D. Loper *et al.*, Whyte also suggested that all these events were driven by changes in the Earth's interior. Whyte used shell-growth patterns do deduce the rotational history of the Earth. He noted the close link between spin changes and changes in the geomagnetic field. Whyte concluded that the Earth had slowed down during the Cenozoic, the late Devonian to Permian and the Ordovician periods. On the contrary, the Earth had speeded up during the Silurian to early Upper Devonian and in the Mesozoic periods. Whyte found that it was at the turning points between these phases where one found magnetic and climatic instability and mass extinctions. He also found what he referred to as "aborted turning points" in the middle Carboniferous and late Jurassic periods. Could these have been Pole Shifts of a more minor nature where the effects were not as violent as at other times? Could Pole Shifts vary in intensity? I don't see why not. Whyte wrote:

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> Despite the many imperfections and biased nature of the geological record a subtle but distinctive background pattern can thus be detected in it. **Whatever the cause may be, this pattern is not only a record of surface processes but also of deep seated events some of which may even have taken place within the Earth's core**.[15]

ARE ASTEROIDS AND COMETS REALLY TO BLAME?

Since the 1980s, the most popular "external influence" on geological and geophysical phenomenon has been the asteroid/comet impact theory. There is no doubt that major impacts have occurred. But can major impact events be matched with geomagnetic reversals? Initially this seemed to work. Perhaps what made it so easy was that there were so many reversals and impacts to choose from. By the 1990s, however, doubts had begun surfacing regarding all of these once accepted correlations.

Richard Kerr pointed to the work of Schneider and Kent. They had studied sediments off the Ivory Coast, from the Bosumtwi crater which contained microscopic glassy debris known as microktektites. They found the sediment layer wherein the reversal had been "recorded" (by magnetic mineral grains). This layer was below the layer which contained the microtektites from an asteroid impact. Their conclusion:

> 'The Bosumtwi debris fell to the sea floor 30,000 years after the reversal.' Schneider and Kent have also asserted that the Ries Kessel evidence is 'unconvincing', and finally, that the Australian microtektite time-correlation with the 700,000 year reversal is likely only 'coincidental.'[16]

These scientists had questioned the previously accepted evidence and now found it to be invalid!

But can impacts really cause reversals? Scientists have frequently proposed the "climate-change mechanism" which it is thought might cause a geomagnetic reversal. This is when the dust clouds from the impact trigger a cosmic winter. This causes the freezing of ice and water which then affects the Earth's rotation rate. This in turn ultimately affects the circulation in the Earth's core which then triggers a magnetic reversal. R. Muller and D. Morris commented that: "Much of this cause-and-effect chain is still speculative."[17]

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Another suggested mechanism is the “shock/pressure mechanism.” Here, a shock or pressure wave propagates through the crust and mantle through to the core, where it induces changes in the flow of the core material (perhaps through a pressure effect on the freezing rate at the core-mantle interface).[18]

R. T. Merrill and P. L. McFadden studied both of these proposed scenarios (climate-change and shock/pressure). They thought that the first was too uncertain and speculative. The second one was not strong enough to produce reversals. They concluded:

> External initiations for magnetic reversals can be ruled out on the basis of observational evidence as mechanisms for the vast majority of reversals, and probably for all reversals.[19]

The idea of the Earth itself being the cause of major catastrophes is not likely to sit well with many people. It suggests of course that the surface of the Earth might be inherently unstable and perhaps we are helpless to change this. Surface instability would seem to me to be a natural consequence of hollow worlds (because of the probable erosion of the inner crust of the planet). Some of this has made me wonder whether the outside of a planet is truly the best place for life to exist? Could it be that the only place where life can exist safely for millennia at a time may be deep inside the Earth? It has led me to wonder if we live in an “inside-out universe.” Could it be that life exists as a norm on the inside of planets rather than on their surfaces? Why do we live here on the outside of this world? Is there something else which we should know? Does all advanced life migrate into the inner realms of Hollow Planets?

RAPIDLY RISING LAND

Let us now explore one possible consequence of a Pole Shift. Could a seabed rise very rapidly and create dry land? If this were to occur one might find sea-going creatures high above sea level. This idea flies in the face of geology as we know it. Nevertheless it is a thought worth examining.

In 1849, in Vermont, USA., between Vergennes and Middlebury, a whale skeleton was found embedded in clay.[20] How does a whale find its way on to dry land high above sea level?

In 1871, at Cornwall, Ontario County, Canada another whale was found.

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It was closely related to the white whale of the Gulf of St. Lawrence.[21]

In 1888 it was reported that a whale had been discovered in Sweden. Dr. C. Aurivillius read a paper on the skeleton of the so-called Swedenborg whale which had been discovered in the province of Halland during the previous year. The whale was found in a layer of marl, 50 ft above sea level. It was noted that this species of whale had been discovered only once before early in the previous century. Some remains of this species had been discovered in the province of Western Gothland at an altitude of 330 ft above sea level and 70 mi inland. At first it was thought to be the remains of a giant, but later Swedenborg discovered that it was indeed a whale.[22]

Part of a whale carcass was found entombed in the ice-cored moraine at Sveabreen, Ekmanfjord, in Vestspitzbergen. The whale was approximately 23 ft above sea level. Its bones and decomposing flesh were found. As the ice melted further each year more of the whale was uncovered. The head and shoulders had been carried away during present-day erosion of the moraine. The remainder of the carcass measured 30 ft and it was estimated that its length when complete was about 60 ft. D. Dineley and P. Garrett were curious as to how this animal had become entombed. They wrote: “One would expect a dead whale to float and hence decompose during the summer months, even if it died in the winter.” They proposed that perhaps it had been trapped beneath the ice and held there. As the ice advanced it might have pushed the whale, along with sediment and the shelly fauna from the fjord floor to the position where the moraine was. They also remarked: “It is surprising that the body remained intact during the movement.”[23]

In the above theory the writers wondered how the whale could have remained intact if it was pushed from the fjord floor on to dry land by ice. So one wonders whether this scenario is really practical. They also had to explain why sediments and fauna from the fjord floor managed to rise 23 ft above sea level as well. What if the whale was beached by a rapidly rising fjord floor and then trapped underneath ice which had, until then, been floating on top of the water? This might sound like a very bizarre idea.

Immanuel Velikovsky pointed out many decades ago that in Alabama and the other Gulf States one finds the bones of an ancient species of Tertiary whale, the Zeuglodon. There are so many of these bones in the fields and they were such a “nuisance” on top of the ground that the farmers piled them up to make fences. As Velikovsky asked: “There was no ice cover in the Gulf States; then what had caused the submergence and emergence of the land

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there?"[24] Did Alabama and the Gulf states literally rise out of the ocean, entrapping enormous numbers of Zeuglodons?

If land were to rise that quickly one might expect sea water and sea life to become entrapped in the waters which later become lakes. Consider the case of Lake Baikal in Russia, and Lake Tanganyika in Tanzania. Lake Baikal has freshwater seals. No surprise there. But, A. O. Kelly reports that Lake Baikal also has marine sponges as well as salmon and herring. Yet, Lake Baikal is now 1,000 mi away from the Pacific where this fauna originates.[25] I wonder if an entire continent such as Australia for example could rise from the seabed swiftly by way of Pole Shift triggered earthquakes?

The early European explorers of Africa remarked that Lake Tanganyika supported marine-like fauna as well as the freshwater fauna of the other nearby lakes. In 1896, a Mr. Moore journeyed there. He found no jellyfish, nor any other marine-like fauna in the Lakes of Nyassa and Shirwa. But in Lake Tanganyika he found jellyfish and entire series of molluscs, prawns, crabs, sponges, and smaller things none of which appeared in any of the lakes he then knew, and all of which were distinctly marine in type. He also discovered that none of these strange marine-type animals could be compared directly to current marine life. Yet, their structure suggested that they preceded a number of marine types in the evolutionary series. As W. Hudleston remarked:

> . . . they appeared to hail from the marine fauna of a departed age. The most definite result of the first Tanganyika expedition, therefore appeared to be that the sea had at some former time been connected with the lake, but when or how remained a mystery. (Hudleston, W. H.; *On the Origin of the Marine (Halolimnic) Fauna of Lake Tanganyika*, Victoria Institute, *Journal of the Transactions*, 36:300, 1904).

Lake Tanganyika is now more than 1,000 meters above sea level and is approximately 500 miles from the nearest ocean so how could it have been connected to an ocean? Unless, the seabed had risen 1,000 meters in the intervening years?

Many people have remarked that the Andes mountains in South America look "young" geologically and paleontologically. These comments have come from scientists and laymen alike. The objective evidence cited in favor

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of this idea is as follows:

1. Plant Fossils have been found at very high altitudes.
2. There are very high beaches which contain recent marine shells.
3. Seahorses have been discovered in Lake Titicaca. (This particular point is still under some dispute.)

The strongest evidence that the Andes mountains have risen very recently (geologically) comes from the discovery of plant fossils. Earlier this century fossil plants were discovered at Corocoro at an altitude of 13,000 ft and at Potosi at an altitude of 14,000 ft. Among these plants is a type of fern and also tropical trees which are related to those now living in the Amazon lowlands. This suggests that the climate at these high altitudes was once more humid and that perhaps the land there was at a lower elevation.

E. W. Berry wrote a paper about these discoveries. He commented that:

> . . . the sea deposited a part of these strata [on the Bolivian highland] in late Tertiary or Pleistocene time, and since that time there have been differential vertical movements amounting to **a minimum of 13,500 ft. . . . There is, then, definite evidence that parts of the high plateau and of the eastern Cordillera stood at sea level in the late Tertiary.**

At the same time, at the turn of century, Bowman wrote various papers in which he demonstrated the rapid and recent upliftment of the Central Andes and also *The Andes of Southern Peru* (1916). Bowman's argument is based on detailed topographic surveys of southern Peru. He concluded that ". . . an uplift of at least 7,000 ft is demonstrable and that it may have been much more."[26]

POLE SHIFT AND THE ARCTIC CLIMATE

If the Earth has tilted at different angles in the past then it follows that the current Arctic regions might once have had a tropical or temperate climate. It follows too that equatorial lands might exhibit evidence of a much colder climate in the past (which is something the proponents of ice ages need to consider). Scientists know that the Polar regions were once warmer. Scientists today maintain that once upon a time, the planet's climate was

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warmer as a whole. But if the Polar regions were a lot warmer, what would have happened in the tropics? Would anything have been able to survive in such a hot climate? Or was it rather, that while the Poles were once hotter, that the equatorial regions were once cooler? That might suggest that a Pole Shift took place, at least once, if not more often.

Immanuel Velikovsky made this same argument back in 1965, and it is as relevant today as it was then. He remarked that geologists and paleontologists had discovered ample evidence which showed that huge forests had once existed near the poles. Fossil plants and coal had been found there. Velikovsky wondered how luxuriant plants could have survived the long polar nights even if there was a more benign climate (perhaps 30° higher than now). He asked: If the temperature in the arctic was much higher then what happened in the tropics? Velikovsky said that there was no evidence in the fossil record for a much hotter climate in the tropics.[27] How could life have survived in the tropics if it was 30° hotter than now?

Velikovsky was definitely suggesting that a Pole Shift took place. He thought it was induced by a close encounter with another planet. I am not a supporter of Velikovsky's theories. He did however raise a number of valid issues. I am suggesting that a Pole Shift might be a natural phenomenon, a natural occurrence endemic to most if not all Hollow Planets.

If the Earth tilted and the arctic were to become warmer then the tropics would correspondingly shift to a new position which would make them cooler. The plants in the former polar regions would not need to adapt to the long polar nights since the new latitude of the former polar regions would result in more sunlight anyway.

Velikovsky was especially interested in the thick coal beds which were covered with black shale and fossilized land plants which are located on the northern tip of Spitzbergen. Velikovsky quoted A. Geikie, the noted geologist:

> When we remember that this vegetation grew luxuriantly within 8°15' of the North Pole, in a region which is in darkness for half of the year and is now almost continuously buried under snow and ice, we can realize the difficulty of the problem in the distribution of climate which these facts present to the geologist.

There were great forests on Spitzbergen which produced a bed of coal 30 ft

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thick. Velikovsky opined:

> [Even if the climate was much warmer.] . . .these thick forests could not have grown there, because the place is six months in continuous night. The rest of the year the Sun stands low over the horizon.

Recently Ian Anderson raised a similar issue with the opposite end of the Earth. Anderson notes that according to "conventional wisdom" Antarctica has been covered in ice for more than 15 million years. But P. Webb and his colleagues have:

> . . . found pollen and the remains of roots and stems of plants in an area stretching some 1300 km along the Transantarctic Mountains. This Antarctic wood is so recent that it floats and burns with ease.

In this case, the wood is so "fresh" that it is not even fossilized. Webb and his colleagues suggest that a shrub-like forest grew in Antarctica a mere 3 million years ago. The wood still has to be dated. Anderson wrote:

> Nevertheless, these deposits of fresh-looking wood do suggest that trees recently grew only 400 mi from the South Pole.[28]

The problem in Antarctica is perhaps even worse than in Spitzbergen for the wood has been found at a latitude which is even closer to the pole. Furthermore, the entire continent is covered in a thick ice sheet kilometers deep which keeps the temperatures there low. Immense deposits of low-grade coal have been found in Antarctica which strongly suggest that the climate was once much warmer and that considerable plant life existed there.[29]

Axel Heiberg island lies at one of the northernmost points in Arctic Canada. Virtually nothing grows there now but the remains of a lush forest from the distant past lie there. The forest once contained redwoods and even water firs similar to those found in Florida's everglades. A scientist from the University of Saskatchewan has studied some 15–20 layers of stumps. Some of these stumps are 30 ft long and have a diameter of 3 ft. He has found blackish leaves in the soil. The wood is so fresh that it cuts like fresh lumber and it burns with ease just like the "fossil" wood found in Antarctica.[30]

Corals are animals which need the Sun and warm waters to survive. In Figure 19.2 you can see that the world's coral reefs today extend along the

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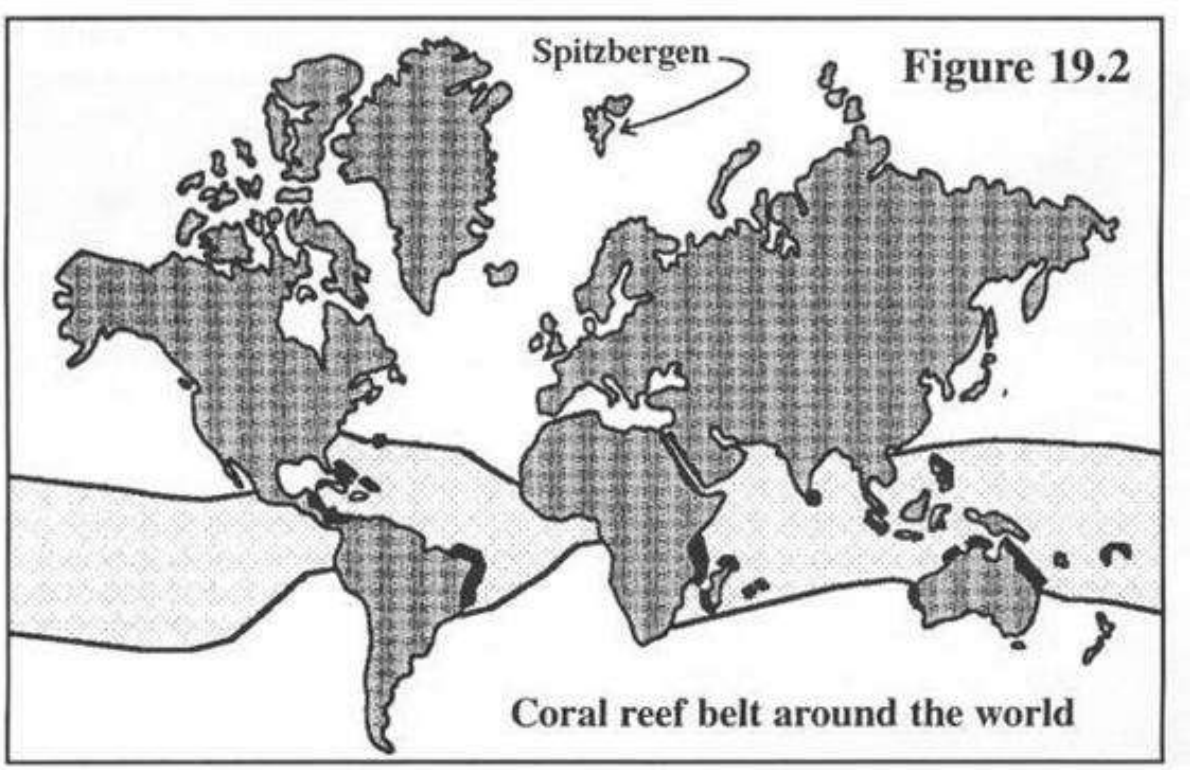
tropics. According to Velikovsky large coral formations can be seen amid the snow and ice of Spitzbergen in the arctic. As the Reader will appreciate Spitzbergen is a considerable distance from the current location of coral reefs.



Velikovsky mentioned that in the past corals grew along the northern coastlines of Alaska, Canada and Greenland. In the Tertiary age fig palms grew within the Arctic circle. Forests of Sequoia gigantea (those giant trees which currently grow in California) grew from the Bering Strait to north of Labrador. Velikovsky quoted D. H. Campbell as saying:

> It is difficult to imagine any possible conditions of climate in which these plants could grow so near the Pole, deprived of sunlight for many months of the year.

Corals are coelenterates (animals) which are usually allied with algae (plants) in a symbiotic relationship. Coral reefs therefore require sunlight in order to live. It seems to me that even if the Earth was warmer in the past, one would nevertheless need more sunlight in the Arctic regions if coral were to survive there. This argument holds true for plants as well.

Scientists merely invoke continental drift as the explanation for these

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out-of-place fossils. But sometimes even continental drift cannot explain it all. Consider for example, the case of dinosaurs in Alaska.

We all imagine the dinosaurs as creatures which inhabited swampy tropical regions. Dinosaurs are thought to be reptiles. A reptile's body temperature fluctuates in accordance with the air temperature. It implies that dinosaurs could only live in warm climates. Recently some scientists have suggested that maybe dinosaurs were really warm-blooded.

Paleontologists discovered the bones of at least three species of dinosaur west of Deadhorse, a small town in Prudhoe Bay, northern Alaska. These finds are at a latitude of 70° N. The real problem is that paleomagnetic measurements show that the latitude has changed very little since the time these dinosaurs lived there. So continental drift cannot be invoked to explain how these remains reached such a high latitude. How could dinosaurs live at such high latitudes which experience two months of total darkness each year? Did they engage in annual migrations over the rugged Alaskan landscape, crossing mountains to reach milder southern climes? Or did these dinosaurs grope around for tons of vegetable matter each day during the dark polar night (in the snow)?

Scientists of course believe that these polar dinosaurs were able to survive on the shores of the Arctic ocean, even in the dark, because the climate there was temperate or perhaps even semi-tropical. They go on to state that the climate of the entire planet was milder and more uniform during the late Cretaceous period. So now, decades after Velikovsky, we are told that the great climatic extremes which we experience today, and the vast temperature difference between the tropics and the polar regions were largely non-existent back then. And I thought that the entire explanation for climatic variation had to do with the amount of sunlight a place received, and that was why the polar regions are so cold?

There is one rather fascinating comment from those scientists. The paleontologists:

> . . . were further surprised by the 'fresh' appearance of the bones they found in the Arctic. There is little mineral deposition in the dinosaur fossils and they seem 'modern'!.

J. Duscheck mentioned these polar dinosaurs back in 1985 as evidence against the idea that the Earth had been struck by an asteroid. He suggested

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that if the dinosaurs could survive happily in two months of darkness in Alaska then they might have survived the long-lived dust cloud which is thought to have been the result of an asteroidal impact![31]

I have wondered whether these dinosaurs were the victims of a rapid Pole Shift. Perhaps Alaska was at a more southerly latitude. Then a Pole Shift occurred which rapidly moved it to its current latitudes where the dinosaurs eventually froze to death as the climate became colder.

The mention of “fresh looking” dinosaur remains is interesting as is the “fresh” burnable wood found in both the Arctic and Antarctic. This “freshness” at opposite ends of the Earth makes me wonder if there was a recent Pole Shift? I wonder if perhaps it wiped out some dinosaurs which may have lived more recently than 60 million years ago?

Dinosaur remains have even been found in Antarctica. In 1991 the remains of a 7.5 m dinosaur were found only 640 km from the South Pole. In this case scientists explained its presence by saying that Antarctica was once further away from the South Pole and hence the climate was milder.

Let’s suppose the continents did move. If so, then some of their movements were very strange indeed. For if Antarctica lay further north in the distant past, then Africa once lay further south—or at least North Africa did. And keep in mind that South America and Africa were joined at their southern extremities to Antarctica . Geophysicist Jon Erickson informs us:

> One finding of these paleomagnetic studies was very curious, however, for it placed North Africa directly over the South Pole during the Ordovician period.

He tells us that in the middle of the Sahara desert there is evidence of widespread glaciation. This was discovered by geologists looking for oil in the Sahara. They discovered a series of giant grooves which appeared to have been cut into the underlying strata by glaciers. These scars had been cut into the rock by heavy glaciers. Further evidence was found in the form of erratic boulders and sinuous sand deposits which were formed by the outwash from streams called eskers.[32]

Russian scientists in Antarctica drilled through the Ross Ice Shelf in 1978. They found the top 1,345 ft to be continental ice which had been pushed off Antarctica onto the sea. The ice in the bottom 33 ft consisted of frozen sea water which had been added to the freshwater ice. Dr. Floyd H.

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Burckle examined this sea ice and found it contained the remains of microscopic plants called diatoms. Diatoms require sunlight in order to survive. These diatoms must have lived in the open ocean. Dr. Burckle commented: “We didn’t expect this at all.” Some of the diatom species found in the sea ice had been extinct for nine million years.[33]

The implication is that these polar seas were free of ice when the diatoms lived and died, and their skeletons sank to the sea floor. It also raises the issue of whether this part of the Antarctic really was in the polar regions at that time—since the diatoms need sunlight. Further, one also wonders what swept them up from the sea floor.

High-latitude heterochroneity is a term which is applied to the interesting fact that some polar fossils not only resemble those found at lower latitudes but seem to be much older. Could it be that new life forms evolved in the polar regions in spite of the colder climate and lack of sunlight during the winter months? Did these new life forms then migrate towards the equatorial regions? Biologists have long thought that the warm tropics and the wet rainforests were the cradles of evolution. The abundance of sunlight and water makes this a reasonable suggestion.

The idea that new plants and animals have first evolved in the Arctic and then migrated southwards was suggested in an article in *Science News* in 1983. It mentioned that the “Magneto-stratigraphic correlation” of the Canadian high Arctic and the Eureka Sound Formation had revealed that there was a considerable time difference between the appearance of various animal and plant life in the Arctic and the mid-northern latitudes. It was found that some Cretaceous plant fossils in the Arctic were up to 18 million years older than similar mid-latitude fossils. Typical Eocene vertebrate fossils found in the Arctic were between 2–4 million years older than those found further south.[34] But what if life did evolve in the tropics, but that the tropics at that time happened to be at or closer to the current polar regions?

The Reader should note that these results are highly controversial, particularly the magneto-stratigraphic dating, which is thought to be inaccurate.

Even though magneto-stratigraphic dating is highly controversial, it does seem to produce unexpectedly consistent results. Applications of this technique in the Antarctic corroborate the discoveries made in the Arctic. Thus, high-latitude heterochroneity has been detected in both polar regions. In other words, it seems that animals and plants in the Arctic and Antarctic

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are older than those at lower latitudes. With regard to the distribution of certain marine fauna, W. J. Zinsmeister and R. M. Feldmann concluded:

> The high latitude region of the southern hemisphere acted as a center of origin and dispersal for a broad spectrum of taxa.[35]

I wonder what other surprise discoveries lie in store for us under the Antarctic ice cap?

These results are in line with other evidence that the Polar regions were once warmer and very possibly had more sunlight. It seems possible that some of the dinosaurs found in warmer climes may have had their origins inside the polar regions and perhaps these regions once lay closer to the tropics or even at the equator. Let us suppose that the Earth's crust is rigid, and yet the Sahara desert was once at the South Pole. If that is so, then North and South America, Greenland, parts of Russia, China, Tibet and India would fall more or less on the equator.

Keep in mind that the Wisconsin basin was once the North Pole. If it was the Earth that moved and not the continents then it would seem that the motion has been considerable indeed. Any place on the surface of the Earth could end up either at the equator or in the polar regions. If this is due to a redistribution of mass on the surface and inside the planet, then it follows that individual Pole Shifts may be quite small—amounting to several degrees at a time. Over long periods of time these incremental changes may cause the entire Earth to reorientate itself considerably.

SCIENTISTS AND THE POLE SHIFT

Even though Prof. Hapgood is the father of the Pole Shift idea, and even though Albert Einstein thought it was a very good idea it has taken a considerable time for it to be taken seriously by scientists. However, just as catastrophism is becoming more and more acceptable to scientists, so too, to a much lesser degree is the thought that the Earth's surface might move bodily. Of course they still think in terms similar to that of Professor Hapgood where the crust slides over the mantle.

The problem with this concept on a solid Earth is that the entire Inner Earth is densely packed. The only driving force is the uneven distribution of continents and the ice caps. In a Hollow Planet scenario where the entire crust is rigid and where cavities deep inside it are a possibility, we might have lots

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of water inside the crust which might erode and weaken parts of it.

If continental drift does not occur then Pole Shift is the only remaining possibility I know of. And if this is a Hollow Planet then the entire planet must shift bodily. One popular writer, J. White, wrote a book called *Pole Shift* in 1980. Of course he wrote about it in terms of the solid Earth. In the 1994 edition of his book he changed his mind and decided that the Pole Shift idea was actually unworkable. While doing my own research into this matter of Pole Shifts I had a look at White's book to see if there was anything of use in it. I found nothing in it which I thought was of great value. Indeed, I was put off by his considerable reliance on various prophecies and esoteric material. Since Professor Hapgood originally proposed the idea a considerable amount of rubbish has been written about it. White points to a more recent author, Peter Warlow, who states that Pole Shifts are the result of extraterrestrial happenings (i.e. close encounters with other planets). It seems that Peter Warlow was punting an idea (in 1982) which is literally identical to that of Velikovsky. Although White's book can be considered the most "definitive" word on the subject (in the public arena), I personally could find nothing of substance in it which meant anything to me. There is another book which goes on to say that in May 2005 the Earth will undergo a Pole Shift. I did not bother examining this book. I have heard of the idea and discounted it and regard it as a lot of guesswork with very little substance. It is based on an idea about the alignment of the planets. A similar idea was advanced with regard to 1989, and that idea did not pan out either!

The ideas about a Pole Shift which have been presented here are mine and mine alone. I do not need Velikovsky's ideas of recent catastrophes as support for the idea, nor is there anything White or the others offer which is of use. The issue for me is simple. There is considerable evidence that parts of our planet have moved. If not through continental drift then through what? In a Hollow Planet scenario the only logical options are Pole Shifts, and also the thoughts I have cited regarding the impermanence of continents. No writer has ever suggested that Pole Shifts may be linked to Hollow Planets. It is I who am suggesting that maybe Pole Shifts are endemic and they are possibly quite a normal part of the life of a Hollow Planet.

A final word about Velikovsky. I have used some of Velikovsky's evidence which seems relevant and good. Velikovsky of course tried to show that these events occurred recently. That's not my position. I have no problem with the idea that many of these things happened millions of years

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ago. That is quite fine by me. I don't know when the last Pole Shifts occurred, or how often (if they've ever happened). But there does seem to me to be a reasonably good circumstantial case to be made for Pole Shifts. My only interest lies in considering the alternative options to Plate Tectonics.

So what do scientists think of the Pole Shift idea? In 1986 a serious article in *Scientific American* examined the problem. It noted that most scientists had indeed scorned the thought. The idea that the Earth's crust and mantle can slip over the liquid core was not taken seriously. Early paleomagnetic evidence had shown that the poles had indeed wandered in the past. At first scientists suggested that this was due to sporadic geodynamo instabilities. As more evidence accumulated it became evident that the paleopoles had travelled considerable distances. These distances were too great to be explained away by geodynamo instabilities. Once Plate Tectonics became popular the "excess" polar wandering could be accounted for by the supposed movement of the continents. The writer of that article commented:

> Still further paleomagnetic research proved that polar wandering was still too great to be explained by any combination of continental drift plus geodynamo instability.[36]

That article in *Scientific American* thus opened the way for mainstream science to consider the possibility that the Earth's crust might be capable of slipping. Some scientists had advocated crustal slippage well before White's 1980 book. For example, in 1973, R. B. Hargraves and R. A. Duncan enunciated what they called "true polar wandering" in a paper in *Nature*. They wrote:

> **True polar wandering, sensu stricto, refers to a change in the position of the Earth as a whole** or as outer lithosphere-mantle shell with respect to its rotation axis, which is presumed to be fixed in space. **Such a change could conceivably result from redistributions of mass within the Earth (either by upward convection or downward subduction) whereby its moment of inertia axes shift**.

Such an event would affect all the continental plates. Hargraves and Duncan decided to test the idea that the crust-and-mantle might have slipped with respect to the hot core. They studied paleomagnetic data and the traces left by thermal plumes rising through the crust. They concluded:

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> Comparison of plume traces with palaeomagnetic data from lithospheric plates for the past 50 million years suggests that the mantle has rolled about its own independent axis within an outer lithospheric shell which as a whole is fixed in respect to the Earth's spin axis.[37]

The above scientists spoke in terms of Pole Shift as espoused by Prof Hapgood. They believe a real Pole Shift can take place. They cite their evidence of crustal slip-page. What if the plume traces were be caused by horizontal stresses on the Earth's hollow shell, especially if parts of that shell are not as tightly compacted as we currently believe?

It was only in the late 1980s that Earth scientists began to publish papers which suggested that rapid, significant slippage between the crust-and-mantle and the liquid core could take place. This new concept of "true polar wandering" of course complicates the reconstructions of the ancient continents. How much movement was "tectonic" and how much was due to the planet changing its own orientation? I hope that the Reader appreciates the incredible difficulties involved in making sense of the behavior of our little planet. There are so many variables and so many missing pieces.

R. A. Kerr raised the issue again in 1987. He wondered whether polar wandering had been large enough to actually make a perceptible difference to the maps of the continents? Had it been rapid enough? Had it lasted long enough? New data had suggested that the effects of polar wandering were virtually insignificant. But the latest and most thorough study however had found only 5° of wandering during the last 90 million years. Then there was a relatively sudden polar shift of 10°–15° which took place between 70–100 million years ago. Kerr pointed out that the cause of this sudden shift was unknown. He thought it must have involved a redistribution of mass on or within the Earth. He also noted that the magnitude of this "glitch" is considerable when compared with continental drift.[38]

Some scientists think the effects of Pole Shift are minor compared to continental drift. The study Kerr cited suggests otherwise. The effects of Pole Shift may be far greater than the supposed effects of Plate Tectonics and continental drift. Indeed it may be exceedingly rapid as Kerr found—perhaps even more rapid than he suggests. This may be mountain-building at its most dramatic, not to mention terrifying.

V. Courtillot and J. Besse reexamined the concept of true polar wandering. They found that during the last 200 million years it has been

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approximately 5 cm/yr most of the time. This, in their terminology is “fast.” They noted that in the period 110–170 million years ago there was no polar wandering whatsoever. They noted that this correlated well with a decrease in the number of reversals of the magnetic field. The break-up of continents also decreased during this time. They observed: “Conversely, true polar wander is high when reversal frequency increases.” As can be seen, their results suggest that there is a link between continental break-up, magnetic reversals and true polar wandering.

They tried to find an explanation for true polar wandering. They theorized that it was caused by the emission of hot thermals from the core-mantle boundary. Two exceptional instances of volcanism (at the Cretaceous–Tertiary and Permo–Triassic boundaries) might be associated with thermals released after two long periods of dormancy when there were no geomagnetic reversals. They noted that:

> The environmental catastrophes at these two boundaries are also correlated with mass extinctions. It has been fashionable to blame these extinctions on asteroid/comet impacts. . .[39]

Courtillot and Besse seemed to find a link between polar wandering and magnetic reversals. This seems to happen far too often for it to be accidental. A very important correlation they made is that between mass extinctions and “true polar wandering”. This suggests massive cataclysms and violence may be involved in Pole Shifts. Of course for true polar wandering to be related to extinctions they need to be relatively violent. A movement of 5 cm/yr does not seem to suggest violence. One possibility is that the violence is great enough to destroy the evidence in the first place. Some writers have suggested that the fossilization of entire forests of trees and of large dinosaurs happens rapidly. They suggest that this might be the only way for true fossilizations to occur in the first place.

The Karoo system here in South Africa is but one example of the possible violence of past catastrophes which have struck the Earth. Could this be the result of extremely rapid and violent burial? One should not underestimate some of the violence associated with a Pole Shift. It might not destroy all life on Earth, but the mass extinctions of the past do indeed suggest violent activity. It seems as if there may be a considerable increase in volcanism and earthquake activity associated with it. This is probably what

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causes the mass extinctions.

In a roundabout way, paleomagnetic measurements of excess polar wandering challenge the popular hypothesis of astronomical catastrophism at several geological boundaries. Crust-mantle slippage is not yet part of mainstream geological thinking. True polar wandering makes reconstruction of past maps of continent positions suspect, casting suspicion upon the hypothesis of Plate Tectonics.

Let me suggest another possible factor. We know there is water in the Earth's crust. We know water flows underground—but how deep does it go? If heat does not always increase with depth as is currently supposed, then maybe vast amounts of water (possibly entire oceans) may exist deep inside the crust. The crust has such considerable volume that there might be more water inside the Earth than in all its oceans put together. If such is the case then water might play a role in seismicity. Such water would flow, and this might cause some of the observed effects of "fluidity" inside the Earth. Such water would of course erode and cut channels. It will dissolve various materials (e.g. salt) and transport it elsewhere. Very complex phenomenon may be at work inside the Earth. Such vast amounts of water could cause tremendous mass displacement. Earthquakes might even set entire oceans of underground water into motion which could jolt the entire Earth. If such masses of underground water and other fluids exit, then they may add to the Pole Shift dangers. Could the Chandler wobble be due to inner oceans?

There is a further point which I would like to speculate upon. Could an Inner Sun play a larger role in the Pole Shift phenomenon than we suspect? There seems to be a correlation between magnetic reversals, Pole Shift and extinctions.

We have seen that Gubbins and Bloxham may have found the answer to geomagnetic reversals by mapping the behavior of the "core". They propose that at some point the "core" will reverse the direction of the magnetic field —in a manner similar to that which our Sun does every 11 years.

At the present time the strength of the magnetic field is decaying rapidly. What then? Will it reverse direction? What will happen when the zero point is reached and the magnetic field reverses? There are various minerals and metals inside the Earth which are magnetic or semi-magnetic. If the Inner Sun's magnetic field reverses, will there be a repulsive force between these materials and the Inner Sun, in the same way that two magnets repel each other when similar poles are brought together? Will the Inner Sun

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and the Earth itself repel each other? Will the Inner Sun impart a horizontal magnetic force upon the spinning Earth, thus helping to “push it over?” Could such a sideways force on a “top-heavy” Earth actually cause it to tilt in a new direction? Could such a sudden force trigger a Pole Shift if the planet is top-heavy enough?

What if the reversal of the Earth’s magnetic field is sometimes (but not always) the cause of some of the Pole Shifts and hence some of the extinctions? Could changes in an Inner Sun’s magnetic field affect the value of G? Could this result in some change in gravity for a while? Could this also trigger further volcanism?

Perhaps the polar ice caps, vast inner oceans and magnetic reversals either independently or collectively trigger various types of Pole Shifts. A final factor may be that the Earth’s mass is less than is supposed and this would mean that these factors have more of an effect than scientists currently suppose.

There are many questions and possibilities and I mention them as food for thought.

THE LAST POLE SHIFT

There is a very accurate method of determining any possible movement of the Earth and its continents in recent times (i.e. the last few thousand years). Gnomons are vertical markers which cast shadows. If one has the measurements of the shadow lengths on the shortest and longest days of the year one can then calculate the local latitude at the time of these measurements. G. F. Dodwell is an Australian astronomer who has undertaken a detailed analysis of the observational records compiled for the many gnomons which have been erected all across the civilized world during the last 4,000 years. Dodwell has calculated the Earth’s tilt from the gnomon data.

The Earth’s inclination is supposed to vary cyclically between 22° and 24.5° over a period of 40,000 years. This is thought to be caused by the pull of the Sun, Moon and planets on the Earth’s equatorial bulge (See Figure 19.3). Dodwell calculated the Earth’s tilt using the ancient gnomon observations. He found that the results deviated considerably from the theoretical curve. The Egyptian temple at Karnak, along with other sites extend the deviation as far back as 2345 BC. There is either a systematic

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error in all the ancient gnomon observations all over the world or the Earth's tilt has changed within the last 4,000 years.[40] It is amazing that the startling results of Dodwell's work have not received wider publicity among scientists. For surely if this is true then something far more powerful than Plate Tectonics is at work.

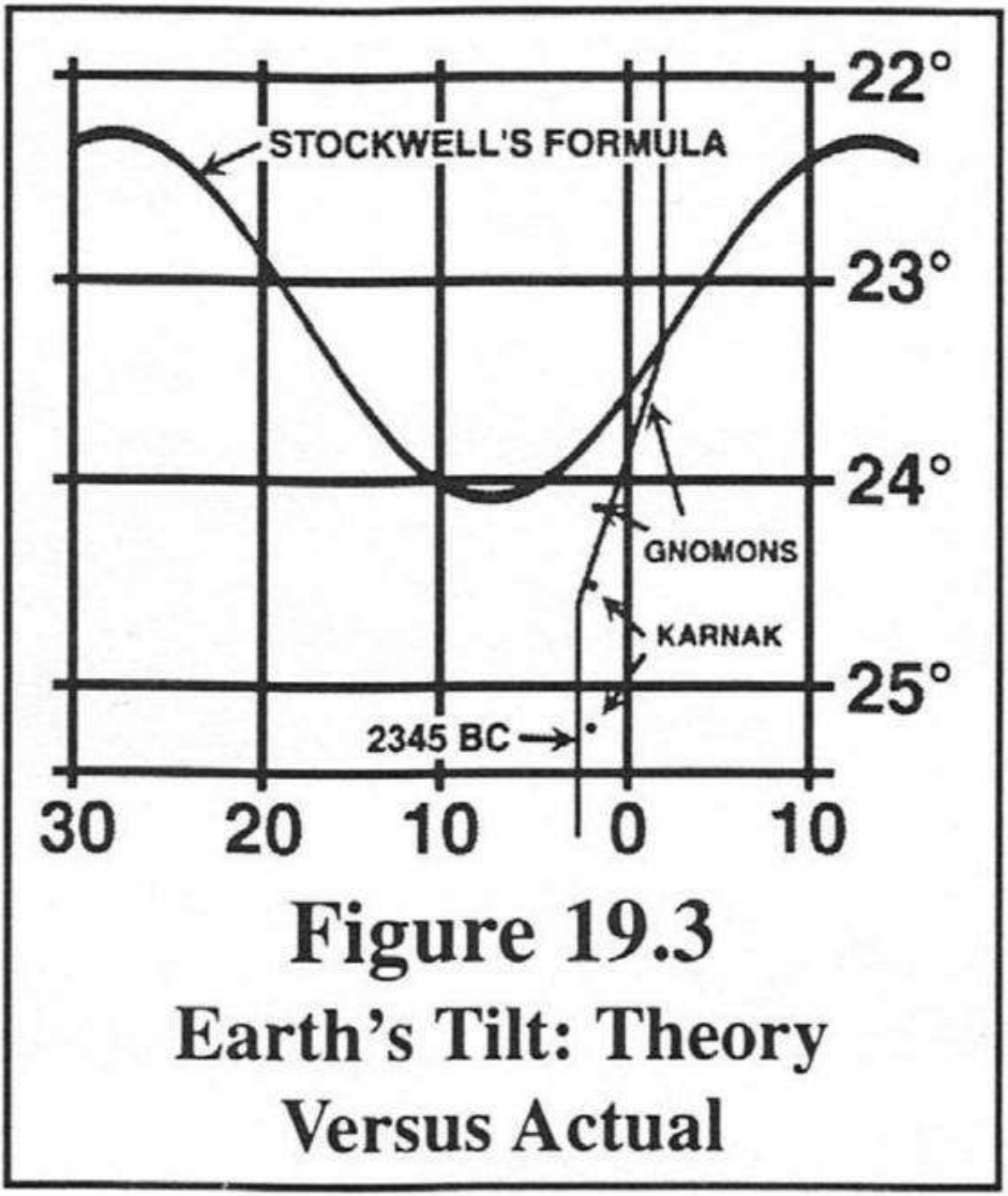

Figure 19.3
Earth's Tilt: Theory Versus Actual

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CONCLUSION

Pole Shifts might be very common, not only on Earth but on other planets too. In my research I found that there was evidence for Pole Shifts both on the Moon and on Mars too. There have been some scientists who have found possible evidence of this.

Even though all the planets in the solar system are supposed to have evolved from the same rotating dust cloud, it should be noted that almost all the planets have their poles inclined by various amounts—of which that of Uranus is the most highly inclined.

The high value for Venus is because its rotation is retrograde and it is considered to be “upside down.” Yet if these planets formed from the same dust cloud then Venus should be rotating in the same direction as the Earth. Since it does not one might infer that the current Venusian South Pole is in fact its original North Pole.

One aspect of Hollow Planet theory which I find remarkable is its unifying effect—because it shows the similarities between vastly disparate planets which one would not expect. Could it be that these planets underwent Pole Shifts of their own, thereby accounting for their current jumbled, nonsensical polar orientations?

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PLANET	ORBITAL INCLINATION
Mercury	0.00°
Venus	177.30°
Earth	23.44°
Mars	25.19°
Jupiter	3.08°
Saturn	26.73°
Uranus	97.92°
Neptune	28.80°
Pluto	122.46° [41]

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Chapter 20: Stop Press

"There is a virtue, I must presume, in shamelessness, since by placing on parade the things one does not know, one discovers that no one else knows either. ~ Robert Ardrey,"The Territorial Imperative," Pg 8

Some new information has come to light since the original text was written. This serves to emphasize how our knowledge continually changes and how new discoveries can upset comfortable old theories. It also emphasizes the need for ongoing thought about many issues which we think have been settled.

GRAVITY UPDATES

A scientist from Los Alamos National Laboratory, D. Ahluwalia, has discovered a conflict between Einstein's general theory of relativity and quantum mechanics. An object falling toward a mass accelerates while, according to our current physics, an object inside a hollow shell does not. Acceleration is absolute, and therefore detectable—according to quantum mechanics. Yet, according to Einstein, the object in question cannot tell the difference between these two situations.

This brings to mind Ron Kotas from my earlier gravity chapter. Ron believed the general theory of relativity was invalid. He felt that quantum mechanics would ultimately provide the solution to the gravity problem. Ahluwalia's discovery has been supported by Samuel Werner of the University of Missouri in Columbia. This is another blow to the general theory of relativity.[1]

LE SAGE–THOMPSON GRAVITATION THEORY

Dr. Tom Van Flandern informed me that he was busy investigating the particle grav-ity theory proposed by George-Louis Le Sage. Le Sage gave a talk to the Royal Berlin Academy in 1782, in which he gave credit to Nicolas Fatio de Duilliers and Redecker. de Duilliers was a close friend of Newton.[2, 3] Dr. Van Flandern informed me:

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I have not looked into any of the original Le Sage references. I have only read the subsequent debate about his models, especially around the time of Lord Kelvin near the end of the 19th century. This is because I was more interested in model viability and criticisms than in its origins.

Lord Kelvin raised the following points regarding “corpuscles” (his term for something similar to Van Flandern’s CG’s):

1. Corpuscles must have a finite mean free path, so the range of gravity must be finite.
2. Corpuscles must be minute compared to their separation. There must be a long mean free path for it to result in an inverse square force proportional to mass. If the mean free path were short, the resultant force would be proportional to cross-sectional area.
3. Matter must be mostly empty space to make shielding effects very small. J.C. Maxwell made the analogy to two swarms of bees blocking light. If the swarms are too dense then swarm effects won’t be additive.
4. Corpuscles must travel very rapidly to convey the necessary momentum, and in order to reduce the frictional force on bodies moving through their medium.
5. If collisions are elastic, no gravitational force will result. So they must lose velocity and raise the temperature of the impacted body. Kelvin postulated that velocity lost by corpuscles is compensated by an increase in the rotation and vibration of the cor-puscles. Maxwell showed that solution was invalid.
6. Maxwell’s proof that kinetic energy of corpuscles exceeds that of mundane molecules rests on an invalid assumption about the relative numbers of corpuscles and molecules.[4]
7. J. E. Oliver calculated that the corpuscular pressure in space would be of the order of $2x10^{14}$ atmospheres.[5]

From the above information supplied by Van Flandern it would seem that there was a debate of a very high order at the time. I’m not sure I agree with all the points raised above, but it is indeed fascinating and the discussion is definitely worth continuing.

NEWTON’S DIARIES

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Earlier in this book we also mentioned the scientists who supported the idea that gravity is a pressure. Dr. Van Flandern expressed the view that perhaps Newton also believed this. Leonhard Euler on the other hand stated that Newton and the "English" in general did not subscribe to this view.

I have come across information which strengthens Dr. Van Flandern's assertion. It comes from an Englishman, John Collins, who wrote an interesting book called *Perpetual Motion: An Ancient Mystery Solved?* Collins stated in his book that Newton did indeed believe that gravity was caused by a pressure from above. His information came from a biography of Isaac Newton written by R. Westfall. It includes some simple drawings of perpetual motion machines devised by Newton. The term "perpetual motion" seems to be something of a misnomer because Newton was intent on tapping gravitational energy rather than hoping the machines would continue spinning forever with no source of power.

While he was studying at Cambridge, Newton took advantage of the laxity of the university to engage in his own studies and thinking. He wrote his thoughts down in various notebooks. R. Westfall had this to say about Newton:

> The mechanical philosophy pictured a world in constant flux. Newton, the tinkerer from Grantham, thought of various devices, in effect windmills and water wheels, **to tap the currents of invisible matter. For example, he adopted the view that gravity (heaviness) is caused by the descent of a subtle invisible matter which strikes all bodies and carries them down. 'Whither ye rays of gravity may bee stopped by reflecting or refracting ye, if so a perpetual motion may bee made one of these two ways.'**[6]

Newton not only dreamed of tapping gravitational energy, but he also sketched machines powered by magnetic fields.

From the information supplied to me it seems that Newton did take the idea of gravity as a pressure seriously when he was a young man. He got himself caught up in a controversy surrounding the issue of perpetual motion, but never aired his views publicly.

For those with a deeper interest in this, Newton's simple sketches can be seen in the biography which I quoted above. The sketches in that book were obtained by courtesy of the Syndics of Cambridge University Library. The

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references for the sketches are: Add MS 3996, ff. 121v, 102 and Add MS 3996, 103v.

Did Newton perhaps change his mind later as to whether gravity was a pressure? I have no idea. Nevertheless, it is very interesting to see that Isaac Newton and Leonhard Euler did think along lines similar to those suggested by Le Sage and Dr. Van Flandern. Perhaps we should take a closer look at these ideas again.

MAPPING THE AURORA

Russian expeditions earlier this century determined that the aurora has a tendency to follow coastlines. This idea was rejected because the aurora is supposed to be a high-level phenomenon which never reaches down to the ground. However, two teams of American scientists have presented new evidence from NASA's Polar

to the American Geophysical Union. Their data suggests that a few percent of auroras are indeed deflected by the Greenland coast. Louis Frank of the University of Iowa stated that "Sometimes the aurora aligns along the coast for hundreds of kilometers." Scientists noticed that as the aurora moved southwards it seemed to strike a barrier when it reached the coast of Greenland. A similar effect was noted by Finnish scientists studying the aurora along the coast of Norway.

Scientists have been puzzled by this behavior. The aurora is supposed to be a high-level phenomenon occurring above 100 km and they see no reason why a land-mass so far below could affect these incoming charged particles. A Finnish scientist, Pulkkinen, suggested that perhaps electric currents were more easily induced in the sea water than on the land, and the resultant magnetic fields would affect the aurora. He nevertheless felt that this effect would be "too weak to detect."[7]

This of course brings us right back to the problem of whether an Inner Sun could control the aurora while also exerting control over the Earth's magnetic field as well as electric currents which may be running inside it. Is the aurora partly electrical in nature? It would seem that these new observations indeed raise the question of whether the aurora is only caused by charged particles from space.

CROCKER LAND

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V. Stefansson has been mentioned on a few occasions in this book. He was a scientist and polar explorer who made the last geographical discoveries in the Canadian arctic this century.

Ted Heckathorn of the Cook Society mentions that Stefansson "had talked much with Peary about his Crocker Land."[8] Stefansson never mentioned what Peary told him. Stefansson then led the 1913 Canadian Arctic Expedition during which ten men and the ship Karluk was lost. During this expedition he discovered Meighen Island.[9]

I find this reference to Stefansson very interesting because of my high regard for him. He was a prominent polar scientist in his time. His interest in Crocker Land only adds to the fact that many very serious people believed that indeed Peary had seen something real.

NUCLEAR REACTIONS INSIDE PLANETS

Throughout this book I have been wondering whether nuclear reactions may be hollowing out planets and if there could be nuclear reactions going on right now inside the Earth and many other planets. I mentioned the discovery at Oklo (Gabon) of a site where a natural nuclear fission reaction had occurred in prehistoric times.

A few nuclear scientists have also been pondering the possibility that nuclear reactions might be the norm inside planets. The leading pioneer of this idea is Dr. J. Marvin Herndon. In the 1990s he wrote a number of papers which explore this very possibility.

One cannot help but wonder if he is touching on a taboo subject because in an article in *Eos* in September 1998 he wrote: "Curiously, the subject appears never to have been addressed in the pages of *Science* or the *Journal of Geophysical Research*." He went on to point out that the implications of the discoveries at Oklo can be applied to other planets as well as to the Earth's core.

In an e-mail dated 9 March 1999, he told me of the difficulties which scientists experienced when they touched on this subject:

> **For whatever reason, the subject of nuclear fission reactors has been exceedingly unpopular in the USA.** In 1956 Paul K. Kuroda predicted the occurrence of Oklo-type reactors; **Kuroda told me that he was only able to publish the paper because at the time the *Journal of***

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***Chemical Physics* would publish one page papers without review."**

> I was fortunate to learn about Oklo almost as soon as [it was] discovered by French scientists. They contacted Kuroda, and Kuroda announced the discovery to his former Ph.D. students. At the time I was a Ph.D. student of one of Kuroda's former students and, of course, I was advised. **Even then, I recognized the importance of the discovery, but it took many years to fill in the pieces so that the implications would become evident and the science would be on secure footings**.

Dr. Herndon's first paper proposing the idea of "planetary-scale nuclear fission reactors as energy sources for the giant planets" was published in 1992. The next year he took this further and found that it could be applied to "nonhydrogenous planets" such as Earth. By 1996, Dr. Herndon had examined evidence from meteorites which supported his thinking. He compared the composition of meteorites with what we know of the Earth. He concluded that:

> In those meteorites, as much as half of the uranium occurs in the portion corresponding to the Earth's core.

He went on to say:

> Uranium or a compound thereof would be expected to precipitate from the Earth's core. . . and . . . would be the densest substance and would tend to collect at the center of the Earth.[10]

Is this not similar to the basic ideas which Dr. Gordeev and I discussed earlier?

We are all familiar with the idea that stars are powered by nuclear fusion processes. In this book I have proposed that perhaps self-sustaining nuclear fission processes operate inside planets. Dr. Herndon has criticized the nuclear fusion start-up models pro-posed for stars. Nuclear fusion can only begin when temperatures are in the order of millions of degrees. But how can a condensing star become that hot? Scientists believe these temperatures arise due to energy which is released through gravitational contraction alone. Dr. Herndon points out that as the star's temperature increases it also radiates more heat. He therefore questions whether the temperatures inside a star

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would ever rise high enough to start the nuclear fusion process. So he suggests that a far more workable alternative is a fission process which first begins and generates the temperatures needed to kick off the fusion process. In other words, fission may be far more common in the universe than we ever imagined. Fission may be starting up stars while also operating inside planets! None of this is currently being considered by scientists who are only concerned with nuclear fusion.

Dr. Herndon has explored the possible effects of nuclear reactions which may be inside planets. He has compared the general behavior of internal nuclear reactions with other concepts such as the slow-moving convection currents thought to be at the Earth's core. He states that to this day, nobody really knows what causes geomagnetic field reversals. Nuclear reactions would be much more intermittent in nature and subject to rapid changes over short periods of time. This would explain the Earth's past geomagnetic field reversals.

Turning to the gaseous giants, Dr. Herndon noticed that Jupiter, Saturn and Neptune produce enormous amounts of energy internally. He proposes that enormous nuclear reactions inside the giant planets may be causing the excessive turbulence in their atmospheres! As evidence, he cites the Great Red spot's strange behavior. In 1878, the Great Red spot became very prominent. Then between 1882 and 1890 its brightness declined to such an extent that astronomers thought it would disappear altogether. Dr. Herndon believes this behavior is the result of a giant nuclear fission reaction inside Jupiter.

My own thoughts regarding the Great Red spot are a modification of that of Dr. Herndon. I agree with his basic concept except that one must allow for a gigantic hollow shell which surrounds the nuclear reaction. A hole in the crust of that shell would then explain why the Great Red spot appears to be a permanent feature of Jupiter.

In Herndon's 1992 paper he pointed out that Jupiter was thought to have the highest internal temperature of any of the planets. Calculations showed that its internal temperature was in the order of 20,000° K. As high as this is, it is still too low to be produced by a nuclear fusion reaction as occurs in the stars. Scientists have thus proposed various other mechanisms to account for these high temperatures. The most popular ideas are those which relate to the release of gravitational energy or the release of potential energy from the metallic hydrogen planetary core. But as Herndon pointed out:

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> . . . there is no proof or direct evidence for the ideas of gravitational energy release within the giant planets and for 20 years scientists have sought a non-gravitational source of sufficient magnitude to power the giant outer planets.

He explained that J. B. Orr had suggested in 1949 that self-sustaining nuclear reactions might occur in terrestrial uranium deposits. But it was P. K. Kuroda who first applied nuclear reactor theory to the problem. He showed that U-235 would have been more abundant in the past and this would have been sufficient to trigger nuclear fission reactions.

Herndon pointed out that the nuclear reaction at Oklo only stopped when it ran out of water. Had it not been for this, the nuclear reaction would have continued for count-less millions of years more. Scientists had discovered that the Oklo reactor had not only consumed U-235 but it had also produced additional U-235 by neutron capture. The Oklo reactor was thus a “breeder” reactor which was able to generate additional fuel for its own use! These discoveries served to prove that long-term self-sustaining nuclear fission reactions are possible in nature.

But can nuclear fission reactions take place in planets such as Jupiter? The only naturally occurring elements which can be induced to fission are uranium and thorium. A moderator is needed to slow down the neutrons so that fission can take place. Here on Earth, at Oklo, water is the suspected moderator. But as Herndon realized, very large amounts of hydrogen and helium are suitable moderators. In fact, the vast amounts of hydrogen available throughout the bodies of these planets creates an environment highly favorable for nuclear fission reactions. His calculations showed that a nuclear fission reaction using U-235 as its fuel was most definitely feasible inside the giant planets. Even more important, thermal neutron fission of U-235 results in the production of other fissionable atoms. This results in a “breeder” reactor which can then utilise fuel sources other than U-235. This means that the nuclear reaction can then continue for much longer than would otherwise be possible. Hence, Herndon concluded that nuclear fission reactions may well be operating inside the giant planets at present.

Herndon went on to emphasize that the energy output from these natural nuclear reactions would not be constant. The fuel to moderator ratios along with changes in pressure, temperature, positioning of fuel, etc would all affect the reactor output. The nuclear fission reactions produce a variety of fission

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products. Some of these adversely affect the nuclear reaction. These materials are referred to as “reactor poisons.” These “poisons” can slow down the nuclear reaction. He speculated that perhaps the low power output from Uranus was due to a reactor shutdown.[11]

In 1994, Herndon applied nuclear reactor theory to the problem of stellar ignition. He showed that nuclear fission reactions might actually ignite thermonuclear fusion reactions in stars.

With regard to the possibility of nuclear reactions occurring inside the Earth, he wrote: “I have presented evidence for the occurrence of substantial quantities of uranium (and thorium) in the Earth’s core and have demonstrated the feasibility for nuclear fission as an energy source for the geomagnetic field. Furthermore, I have suggested that polarity reversals of the geomagnetic field may have their origins in intermittent nuclear reactor output... uranium, virtually irrespective of chemical state, would be capable of self-sustaining nuclear fission, if present in planetary cores and concentrated by gravity to the planets’ center before about 2,600 million years ago.” He went on to point out that reactor poisons could shut down the georeactor permanently or temporarily. This might cause rapid changes in the geomagnetic field or even field reversals.[12]

In 1996, Herndon produced a paper discussing the possible existence of a “sub-structure within the Earth’s Inner core.” Here, within the Earth’s Inner core he expected to find nuclear material and the products of a nuclear fission reaction. He emphasized that the Earth’s magnetic field would be produced right at the center of the Earth by a nuclear reaction rather than at the boundary of the Inner and Outer cores. He suggested that the Earth’s magnetic field was produced by electric currents which were generated nuclear activity.[13]

In an e-mail dated 9 Mar 1999, he mentioned Jupiter:

> It is regrettable that you could not have learned about my work sooner. In May of 1995 there appeared a brief article in *Eos*, entitled *Neptune’s Nemesis*, that discussed the observation of a new spot in Neptune’s atmosphere. The article incorrectly asserted that Jupiter’s Great Red spot had been stable for 300 years and missed what I thought was the most significant implication of the observation. I submitted a short, 500 word response that included references to my work on planetary nuclear reactors and planetary change. **At the time, the *Planetary Science***

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> **Editor, a NASA–JPL employee, insisted that I remove all reference to those subjects as a condition for publication.** I refused. It took me three years and changes of AGU [American Geophysical Union] officers and editors to finally get the word out.

I am struck by Dr. Herndon's reference to the attempted "censorship" of his article. Note how this NASA–JPL employee refused the publication of his article and how long it took before he could have it published. Dr. Herndon does not believe there is anything sinister going on. Nevertheless, the resistance which he and Kuroda met is strange.

Dr. Herndon's revelations represent the final missing piece in the Hollow Planets puzzle. It was very pleasant to discover after all these years that indeed some scientists were thinking of nuclear fission reactions inside planets. It merely serves to add to my confidence that I am on the right track and that pursuit of this matter will lead to real discoveries. It is things such as this which have enormous implications.

It seems to me as if astronomy is not a science where true free thinking is allowed any more. As the Reader will see, Dr. Van Flandern also mentions that there is a certain control of ideas in professional astronomy. Richard Baum complains of the undue adherence to theory even when it does not match observation. These ideas, if pursued, might just lead to enormous breakthroughs which will shake physics to its roots.

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Chapter 21: Afterword

To challenge centuries of learning and seamanship has something ill mannered in it. Certainly, Columbus was not trying to be rude; but new ideas, by their very nature, contain rudeness in them - intrinsically, inescapably. ~ Jeff Nyquist, *The Origins of the Fourth World War*

Dr. Edward De Bono has toured the world for many years teaching, writing and lecturing about creative thinking. He encourages people to look at problems from different perspectives. He encourages young people to look at old problems with new eyes. He coined the phrase “lateral thinking.” This exercise of mine was something of a lateral thinking exercise. We jumped from the current paradigm right into another totally different one and we sampled its fruits. We turned all of planetary science on its head and reconsidered everything from the most incredible perspectives imaginable. We approached a myriad of old and very old problems from angles never before even dreamed of. We just let go of the shackles which bound us, and we wandered into a world that was amazing beyond belief. And did you not find that there were many surprises? Many things still seemed to make sense, and in some cases, they made more sense than before.

Some scientists are not happy with the current state of things. I asked Dr. Tom Van Flandern whether other scientists had come out in support of his ideas on gravity. In an e-mail dated, 24 Mar 1998, he wrote as follows:

> **Mainstream astronomers dare not support science that challenges the mainstream in public. That would imperil their chances of obtaining funding. Many offer private support, but make it clear their encouragement must remain private. The principal public supporters are all colleagues who have severed their own ties with the mainstream for one reason or another—people such as Halton Arp**. If you are speaking of non-astronomers, where peer pressure and funding controls are more limited or non-existent, reactions have generally been strongly favorable.”

Richard Baum is also not happy because good optical evidence is ignored when-ever it clashes with theory. What if theory is wrong?

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It is taken for granted that astronomers will be the first to find extraterrestrial life. The SETI project is the most sophisticated search for intelligent extraterrestrial life ever undertaken. So far it has come up empty-handed. But as the Reader should by now appreciate, astronomy is hampered by many things. The financial controls alluded to by Dr. Van Flandern certainly make it impossible for astronomers to truly be free thinkers. These scientists are monitoring radio-waves to see if they can find an intelligent message. Perhaps they are doomed to failure. Maybe they need to modify their techniques to take into account the possibility of faster-than-light travel. There may be a further twist to the search for intelligent life. In a Biblical sense, we might be searching for something afar when it may be near. Maybe intelligent life has already been found. Perhaps the Navies and Air Forces of certain Arctic nations have already encountered such life. If the search for advanced life is already over, I would appreciate being told about it!

Planetary science is a vast subject, especially as one delves into the finer detail. I have done my best in this book to question everything. I was not purely destructive. For each idea I attacked, I tried to offer one or more new alternatives.

Many of the greatest advances in science came about because someone looked at things from a different angle. Even if none of my ideas pan out, this entire exercise should still have had some value.

The Hollow Planet ideas I have presented here may be weird, but the whole exercise was done in the spirit of science. The ideas which first saw the light of day in this book were all born out of scientific data which I had mulled over. These ideas are all completely testable, and refutable. According to my understanding of scientific method, it is essential that an idea can be tested and be disproved. Everything in here can be tested if only someone would take the time. All I ask is that a few persons with the necessary skills test some of the many ideas presented in this book. Many of these ideas can be tested at little cost.

I doubt if anyone looks up at the Moon or Venus and wonders whether those worlds are hollow. But I do. Maybe now you will join me in wondering the same? I have some-times turned my little telescope towards Venus hoping to perhaps see the Venusian polar collar or the blunted cusps—but I never do. I am not a practiced observer. Astronomy always interested me, but I never had the patience to observe for long periods of time nor to develop the finer skills. So I rely upon others with superior ability.

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I admit that I don't have all the answers. I admit that some of my ideas are not as neat as I would have liked them to be. It is so easy to make mistakes when dealing with scientific issues, and as you know I am no scientist. However, I had to remain true to the evidence as I understood it. For example, most people will think I am insane (not to mention arrogant and foolish) for daring to suggest that perhaps there are Polar Holes here on Earth. I have no doubt that if enough people were to hear of this, I would be the laughing stock of the entire world, mocked and scorned as a fool. If that's how it will be—then so be it. But I have to be honest and true to myself at least and I feel compelled by the many things I came across to draw this conclusion. Many pages in this book are devoted to examining the evidence which points to it - evidence which is too detailed to simply ignore. Both Dr. Gordeev and Dr. Gohnert, being open-minded men of science, have told me this cannot be so. There are no Polar Holes—neither big nor small. They even did a bit of digging on their own to see if there might be some evidence which they could find. They both came up empty-handed. I never presented all my ideas and evidence to them. Like you, they too will only now see the complete idea in print.

In my search for photographic evidence for Polar Holes, I came up empty-handed too. It may be said that I was arrogant enough to assume I could find what scientists could not. As Dr. Gohnert told me, I really could say: planets might be hollow, and the Earth might be too, but the Earth, like, say the Moon, might not have gigantic holes in it. I felt that was the easy way out. I could easily have done that. But I realized that if I did, then most of this book would have to be thrown into the dustbin. I do not want to throw away the evidence because of one missing piece of the puzzle. There is simply too much credible evidence in meteorology, the aurora, arctic history and perhaps even Long Delayed Radio echoes for me to do this. Perhaps I will reverse my position later. But for now, in this book, I want the Polar Hole idea to get a voice and I stand by it. It's the only idea which makes sense which shows a definite connectivity between the Earth's core and it's atmosphere and which opens up entirely new lines of thinking. This is a key issue. So, stubborn-headed person that I am, that is the stance I am taking for now.

I'm not asking you to believe this book. Belief is the last thing I want. Instead, I'm asking you to think about the evidence and the thoughts presented here. Perhaps you have learned aspects of physics you would never have learned about otherwise? If this book has made you think, and think

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hard about our own planet and the planets around us then it has achieved it's aim.

If this book ever makes a professional scientist wonder then it will have achieved it's greatest success. With this in mind, I will donate several copies of this book to some Universities in the hope that a professional scientist may read this for light entertainment, a hearty laugh, and maybe something positive will come of it.

Much more can be done than I have done. I set out to test the feasibility of a bizarre old idea. Perhaps the results have surprised you. They surprised me, which is why I went to great lengths to record them in a book. Perhaps now you will realize how much we do not know, and how much we are not sure of.

There was also an experimental reason for this book. I wondered if there are things which some scientists know but are too afraid to talk about for fear of ridicule, like Barnard was when he saw craters on Mars. If so, I would love to hear it.

There may be much more which has never even been documented by scientists. I noted for example that in the field of "Exotic Terranes" (mentioned earlier), that scientists had strange observations which did not fit their paradigms. None of them wrote anything about it. It took the courage of one scientist to then give the others the courage to come forward with their own observations. Scientists know before doing an experiment what results they expect. What if the results are really strange? Like the fact that the aurora is controlled by something at the equator? Many discoveries are made by sheer accident. The discovery of the Ozone Hole was an accident. At first scientists thought their instruments were faulty. Today, many astronomers think there is something wrong with their eyes or their observations of possible depressions in the polar regions of Venus. How many really bizarre results exist in the sciences, results which make absolutely no sense at all , and which no one is keen to talk about? What if scientists believe some of their instruments are faulty when they are not? In the field of astronomy, many extremely strange things are passed off as optical illusions—but what if some of these things are real? It would seem logical that the strangest observations of all might never have been recorded. The comet-like appearance of Venus being but one example of how strange things can get. What if it's been seen by others but they were too scared to document it in case they were laughed at? If I were to see Venus looking like a comet, I

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don’t think I would advertise that too loudly! So I can appreciate the reticence on the part of professional scientists whose peers can easily destroy their credibility. And what does a scientist have left at the end of the day but his reputation? His reputation is his man-hood. If that is destroyed he is left with nothing.

I have only written about those things which have been documented and for which I could find written evidence from scientifically reliable sources. However, there may be much more than this. One of my hopes was that this book might stimulate more talking and thinking along these lines—just to see what else might come up. Perhaps a scientist somewhere, perhaps a seismologist, or a geophysicist or a meteorologist has conducted some experiments or knows of some phenomenon which is not mentioned in this book, or which is perhaps not even documented. Perhaps this scientist will one day think about that idea and relate it to this hollow planet idea and perhaps “the penny will drop” and he may find that this obscure fact fits snugly into this strange paradigm which I have suggested. That is the kind of thinking I wanted to stimulate and to test—to see if there are facts way beyond my ken which are perhaps only known to professional scientists and which may strike them as a perfect fit for this forgotten old idea. Upon reaching such a realization, perhaps a scientist may then think twice about this crazy old idea. Perhaps there might be something to this madness of mine after all?

Perhaps if scientists spent more time looking at the fringes of the current science they might find in it, the beginnings of a radical new paradigm which will shake our civilization to it’s roots?

I am no scientist and so I do not expect any scientists to take any of my ideas seriously. Nevertheless, I do hope that one day someone will look into these ideas about seismology and gravity. Or someone will devise experiments to look for a small tunnel into the Inner Earth. Perhaps there is fertile ground there for the radical thinking of new thoughts? I find it strange that no one has followed up on Einstein’s thoughts that gravity might be modified by electricity. This might relegate the Cavendish estimates of the Earth’s mass to the rubbish heap, thereby opening up entirely new lines of thinking and experimenting.

Maybe scientists will laugh at me and state that my ideas are foolish? In all probability they will be right. I could easily be wrong—very wrong.

Scientists are always suggesting answers to problems within the narrow

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confines of their reigning paradigms. I have dared to create a new paradigm with it's own answers. Perhaps my paradigm is entirely mythical? Nevertheless, my creation comes from the annals of science and history. Unlike real scientists, I have no commitment to the current paradigm. I can ask crazy questions and propose even crazier answers.

But what is wrong with this approach? Maybe we should look around at our world, and the worlds around us in wide-eyed wonder. Perhaps we should become curious again - instead of being arrogant as we are now? Perhaps we don't have all the answers? Maybe we only think we do. What if we live in an "inside out" universe where there may be more mystery inside planets than on the outside? What if our entire view of the universe is highly skewed because of our situation? What if life on the outside of planets is not the norm? What if the exteriors of the planets are very dissimilar while per-haps the interiors are very similar?

If planets were to be hollow, does that not radically increase our chances of finding other life, any life, right now, in this Solar System? What if other life exists deep beneath the surface inside the Hollow Planets of this, our home, the Solar System?

Perhaps this is not the end of the subject. Maybe it is just the beginning of a great adventure into the fantastic and awesome unknown.

MY CONTACT DETAILS

I am always open to constructive and intelligent criticism. I am especially interested in getting feedback from scientists. I cannot guarantee that I will have the time to reply to all letters. Where possible I would prefer e-mail to postal correspondence.

Unwanted phone calls from telephonic sales people irritate me considerably. I am not giving out my telephone number because I do not want unwarranted phone calls.

I am only interested in serious discussions. Nonsense will be ignored. Once an Australian university student found out what I was busy with and wrote me an e-mail with words to the effect: "What you write about the Hollow Earth is true because I have been there." Talk about chutzpah! And he went on to suggest that I pass his web page address around to other people. That was not dignified with a response! If I believed there was credible evidence that someone had actually been inside a Hollow Earth then

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I would have presented it in the book. I am not interested in being a conduit for various charlatans who are out to milk the gullible with tall tales.

Any further serious evidence found after the publication of this book will be made available to all interested parties via Internet.

My e-mail address is : pbs@iafrica.com

I can also be contacted via Mr Billy Baty: bill@worldwidemagazines.com

My postal address is: Mr Jan Lamprecht, P O Box 1312, Roosevelt Park, 2129, South Africa.

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Image Appendix

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Plate 1

Venus, 14th January, 1979
Part of the "Y" is visible.
NASA Photo 79-HC-46

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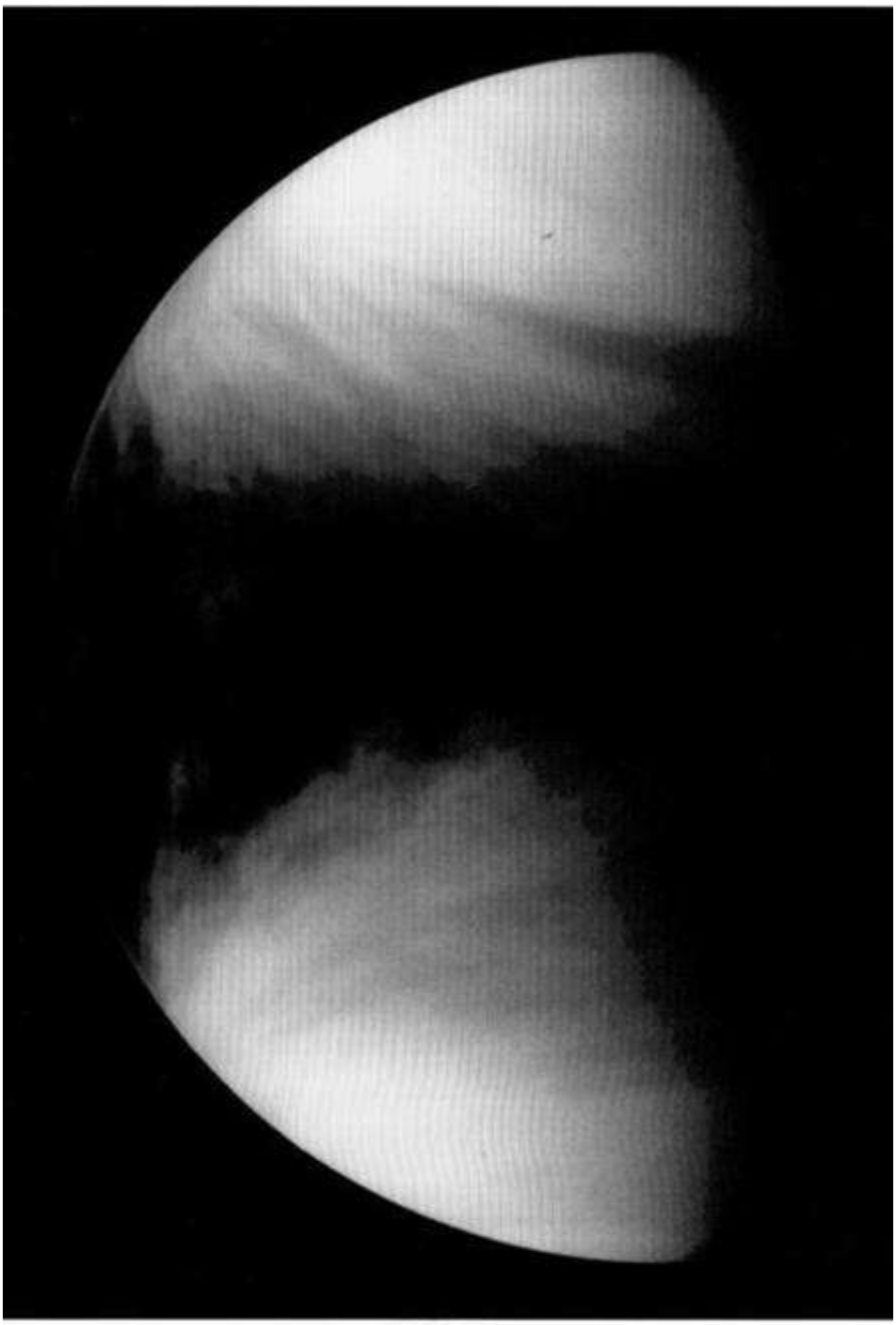

Plate 2

Venus, 30th December, 1978

Note the darkness of the equatorial region.

NASA Photo 79-HC-44

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Plate 3
Venus, 25th December, 1978
Note the bright polar caps.
NASA Photo 79-HC-43

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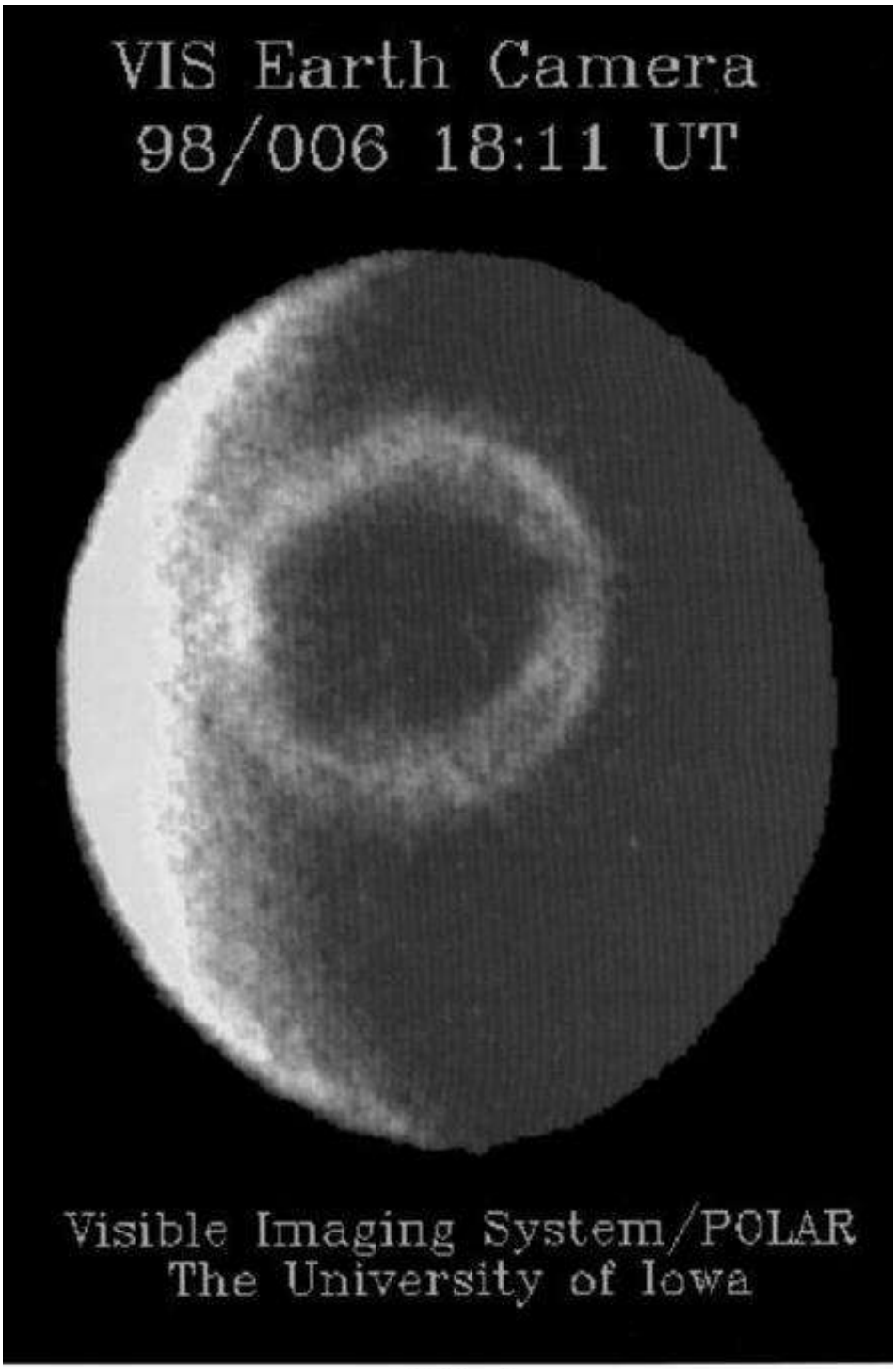

Plate 4

The Earth's aurora on 6th January 1998 at 18:11 UT
Credit: Dr Louis A. Frank, University of Iowa

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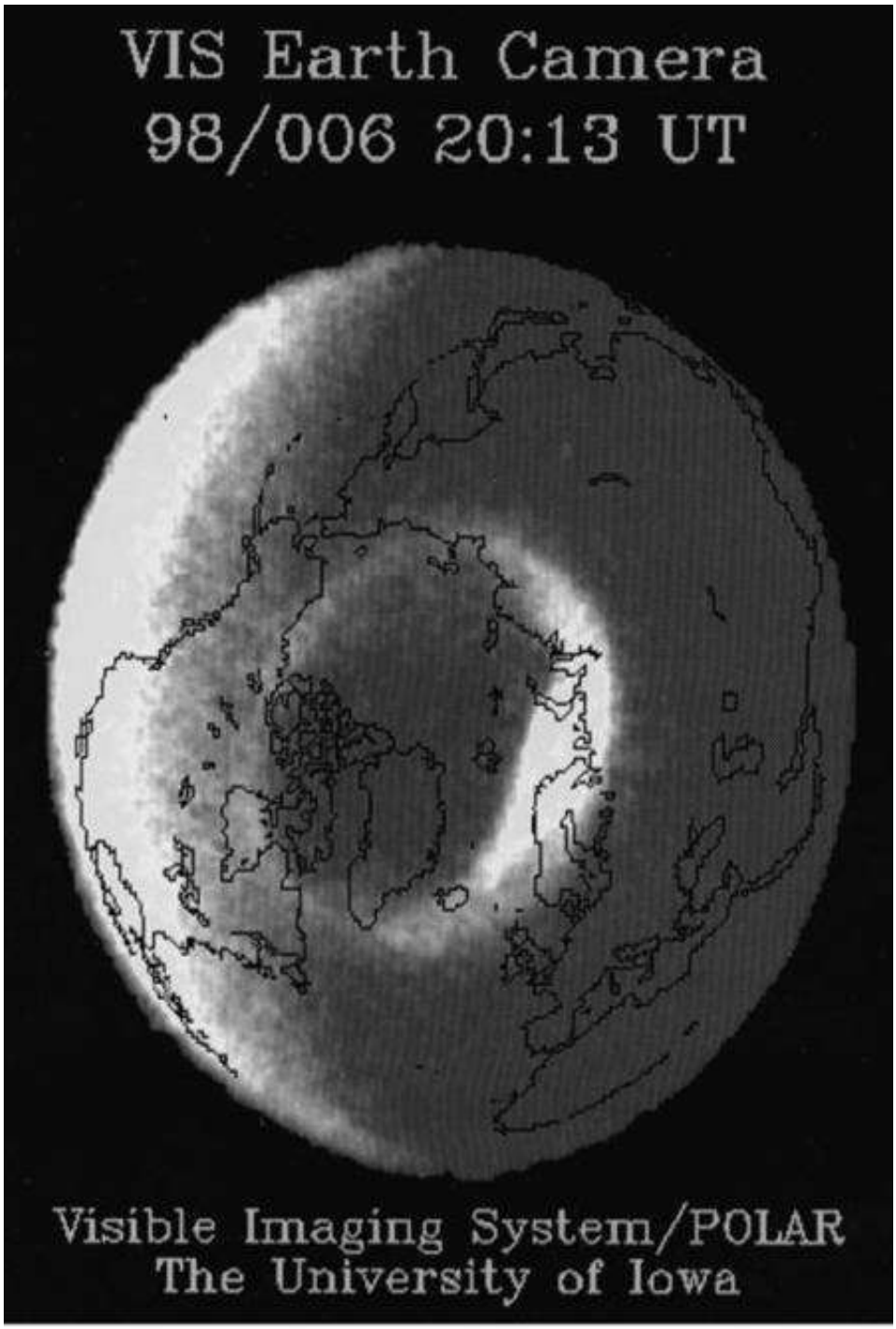

Plate 5

The Earth's aurora on 6th January 1998 at 20:13 UT
Credit: Dr Louis A. Frank, University of Iowa

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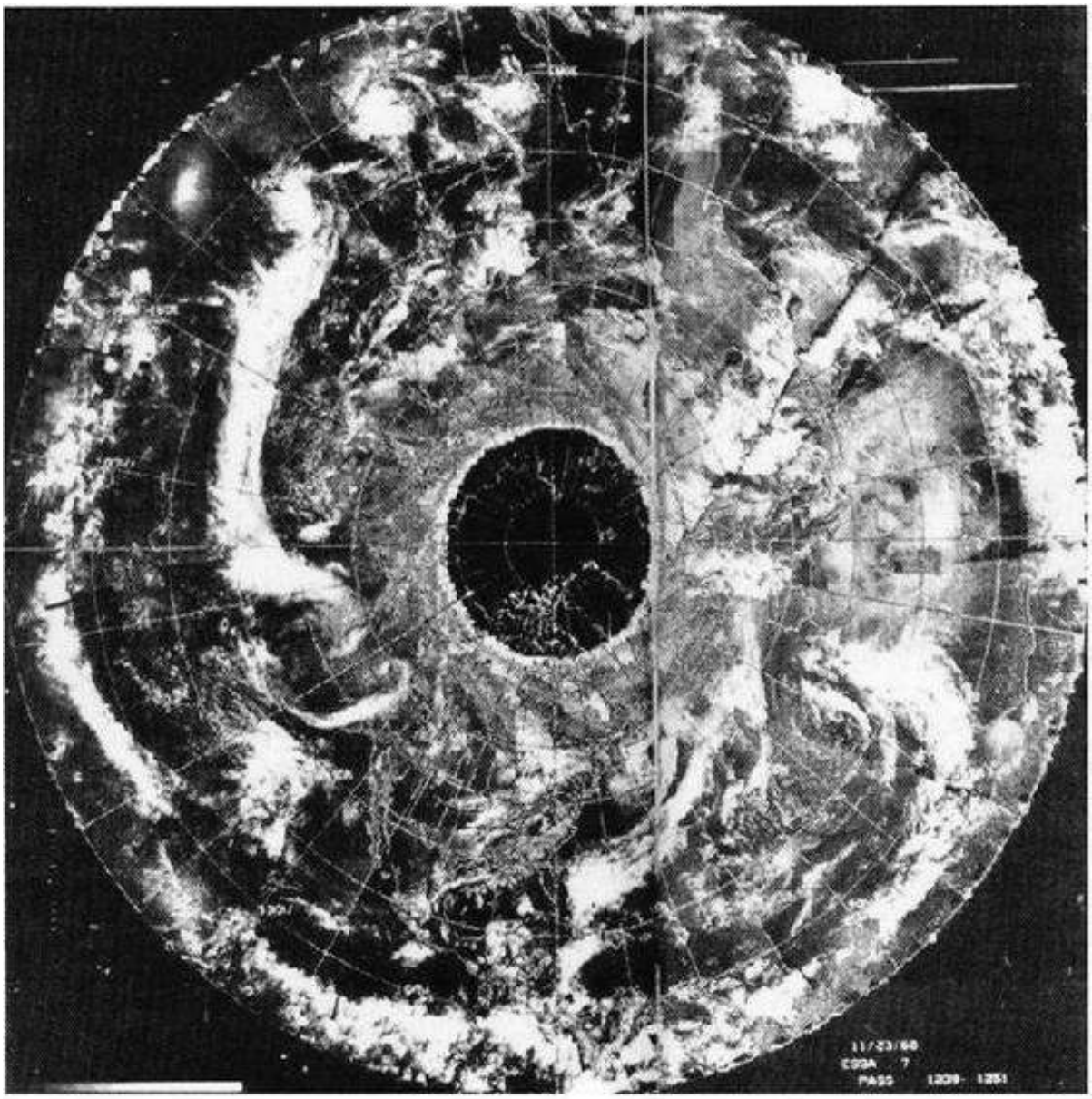

Plate 6

NASA's ESSA 7 photograph of the North Pole
23rd November 1968

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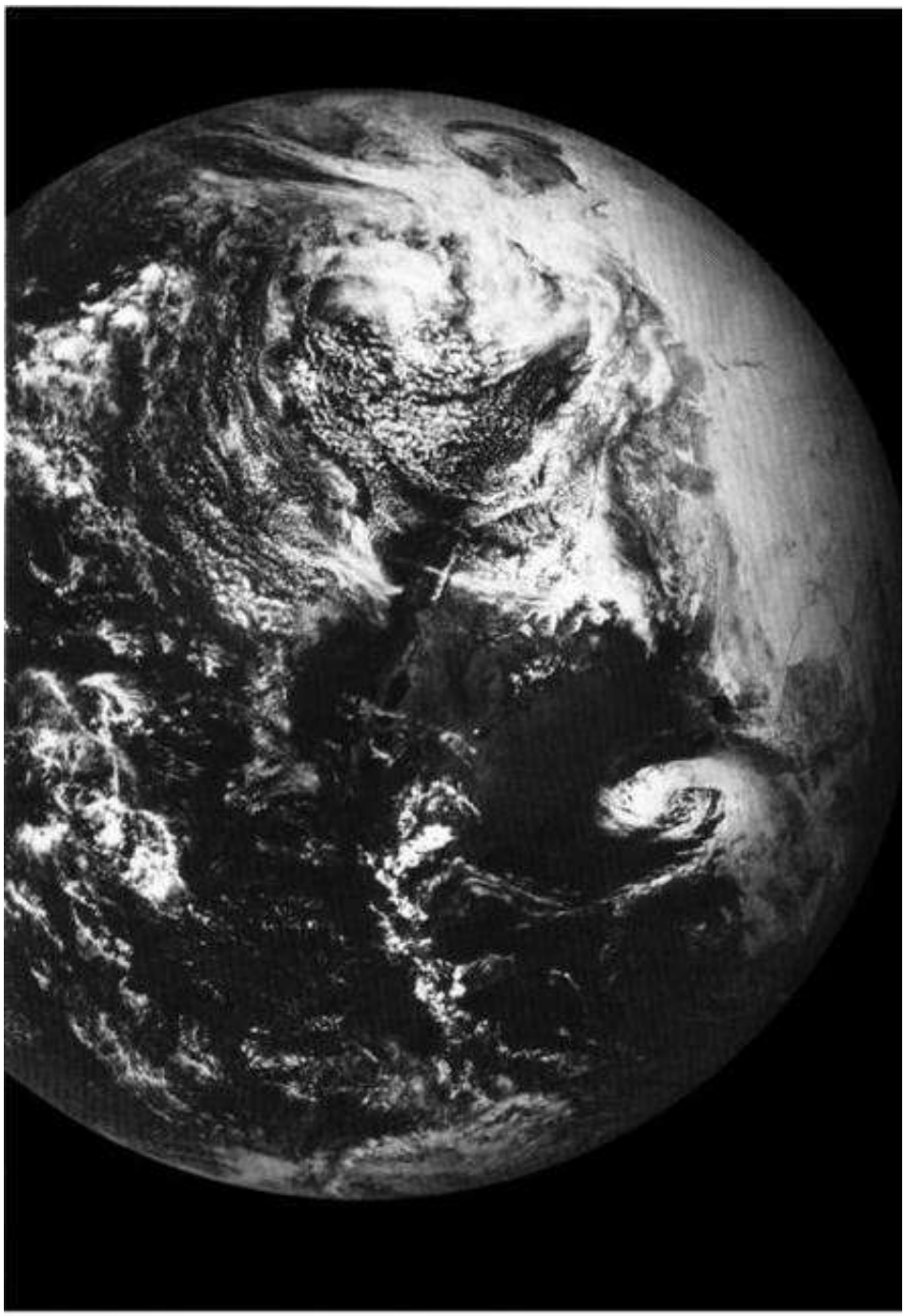

Plate 7

Apollo 16 photograph. What is the strange circular feature at the top of the photograph?
NASA catalogue number: AS16-118-18880

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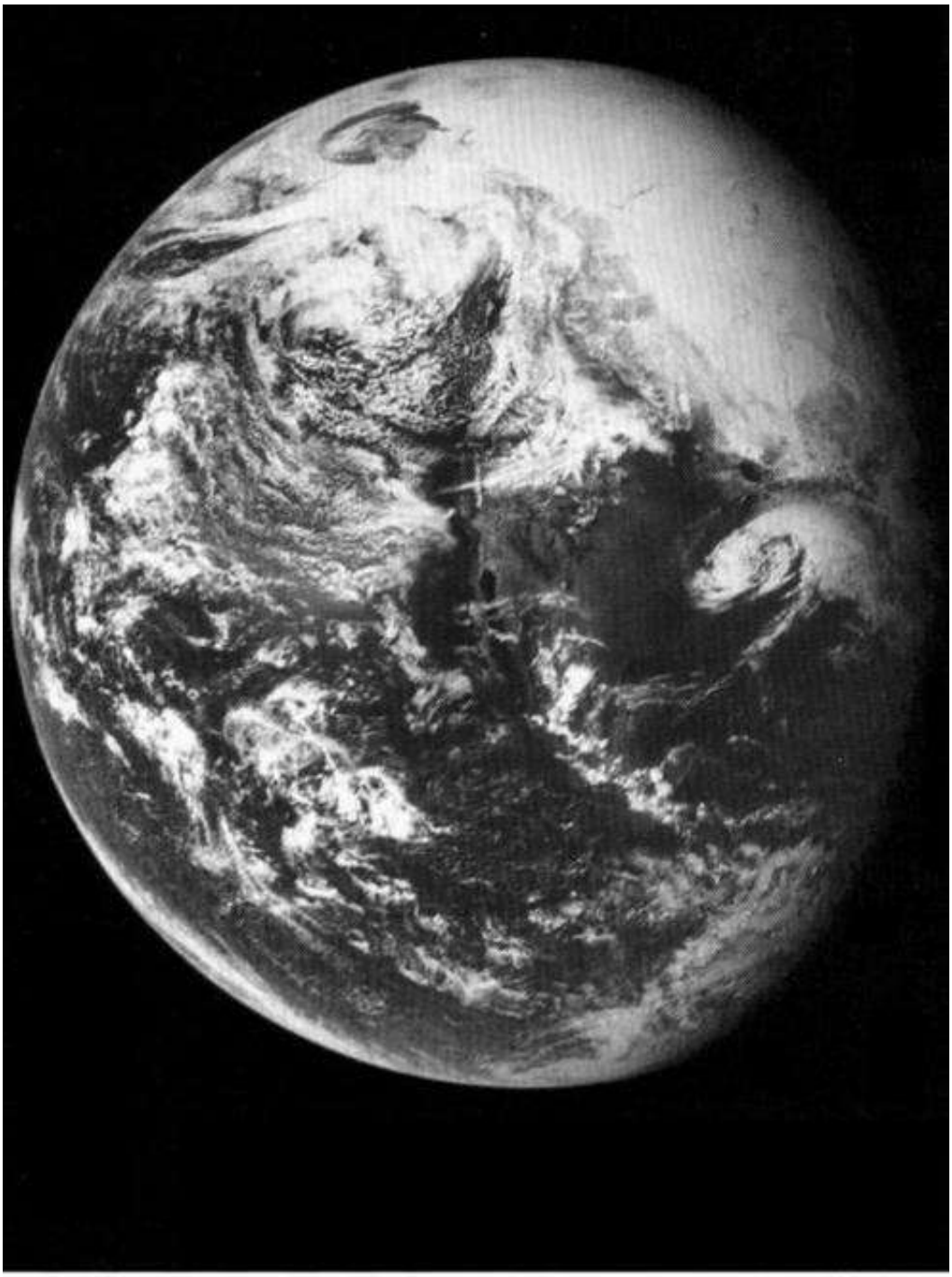

Plate 8
Apollo 16 photograph
NASA catalogue number: AS16-118-18885

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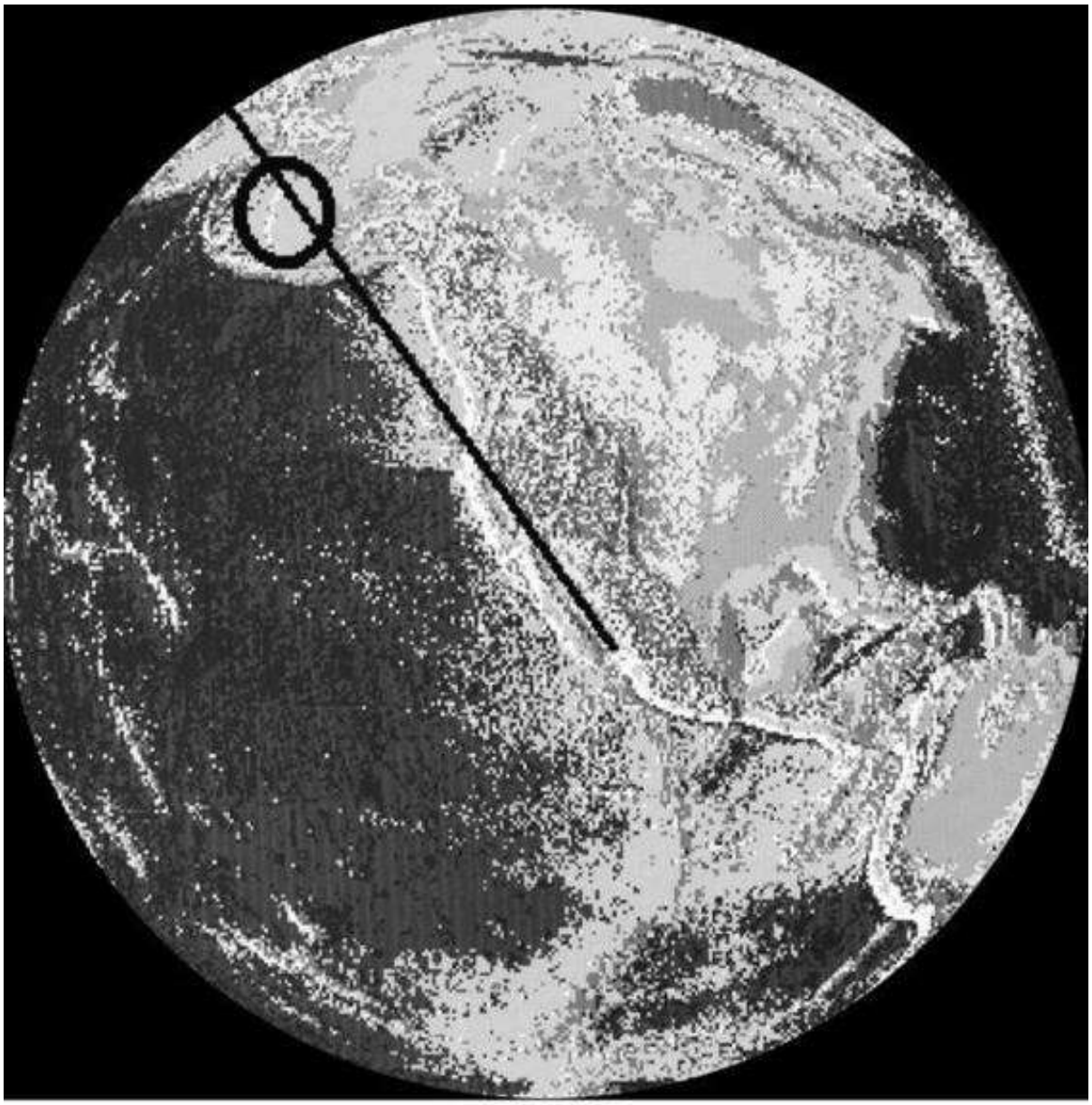

Plate 9

A view of the Earth from Apollo 16's perspective.
Note the position of the circular feature.

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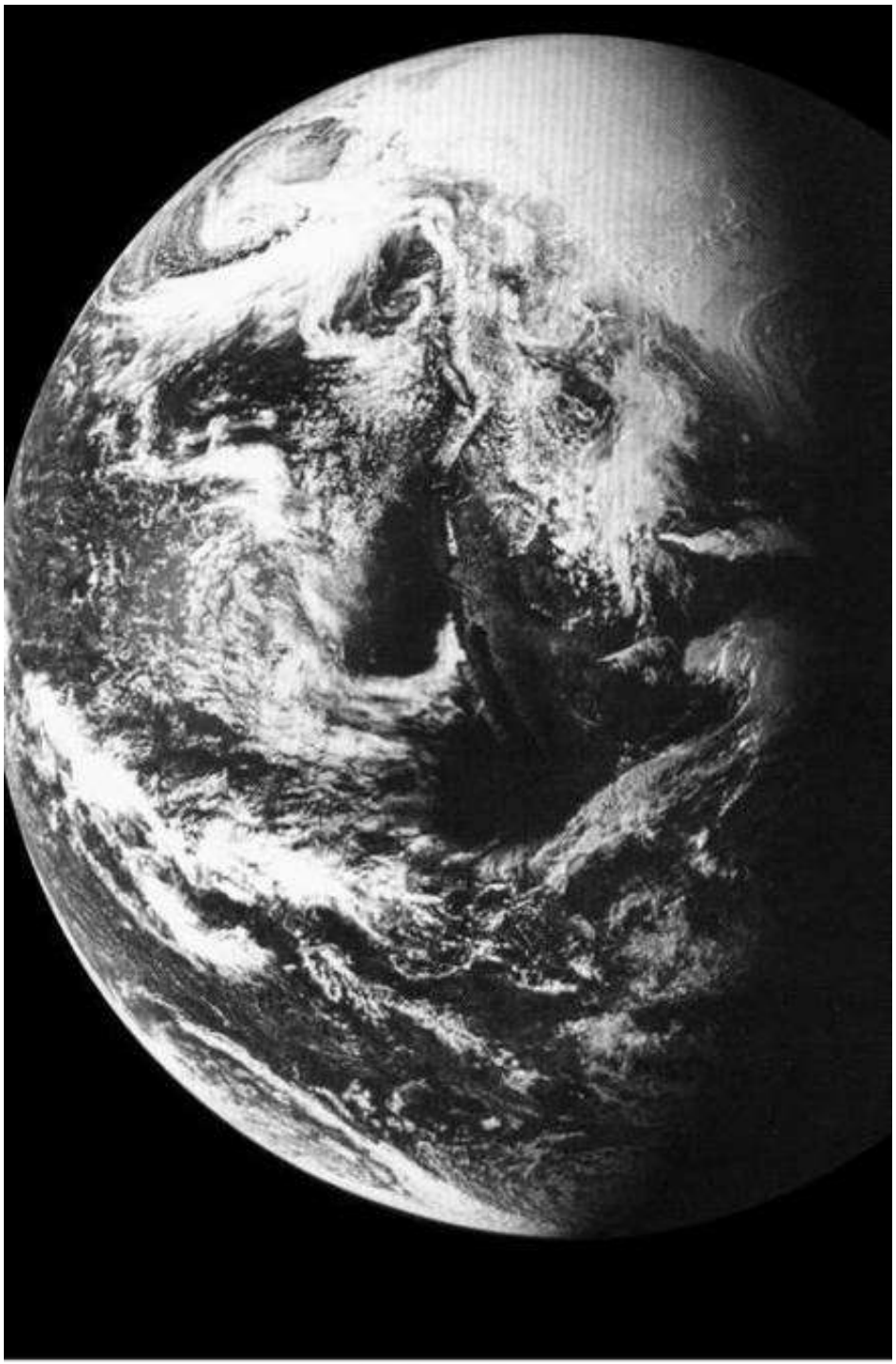

Plate 10

Apollo 13 photograph

NASA catalogue number: AS13-60-85880

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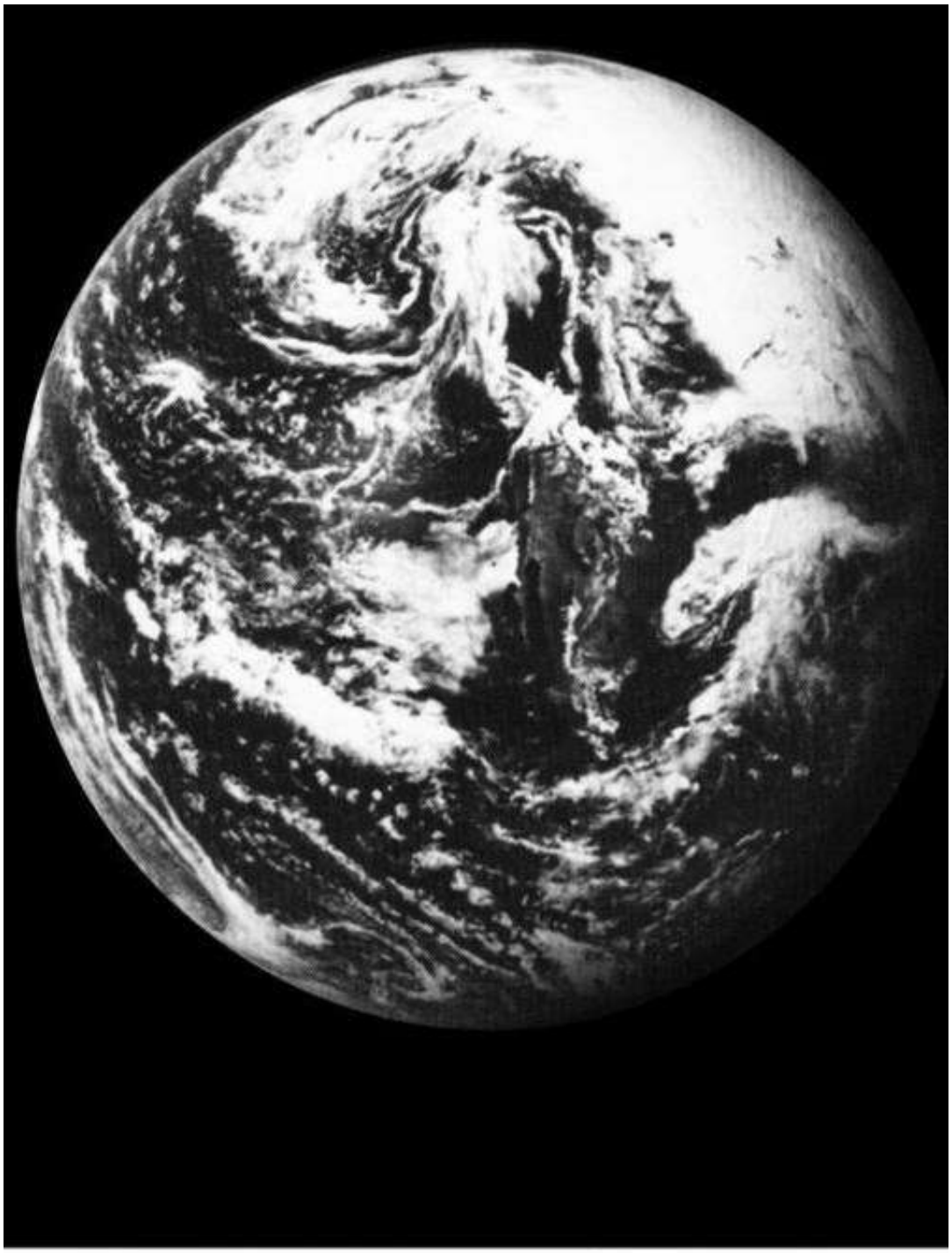

Plate 11

Apollo 10 photograph, 18 May, 1969

NASA catalogue number: AS10-34-5013

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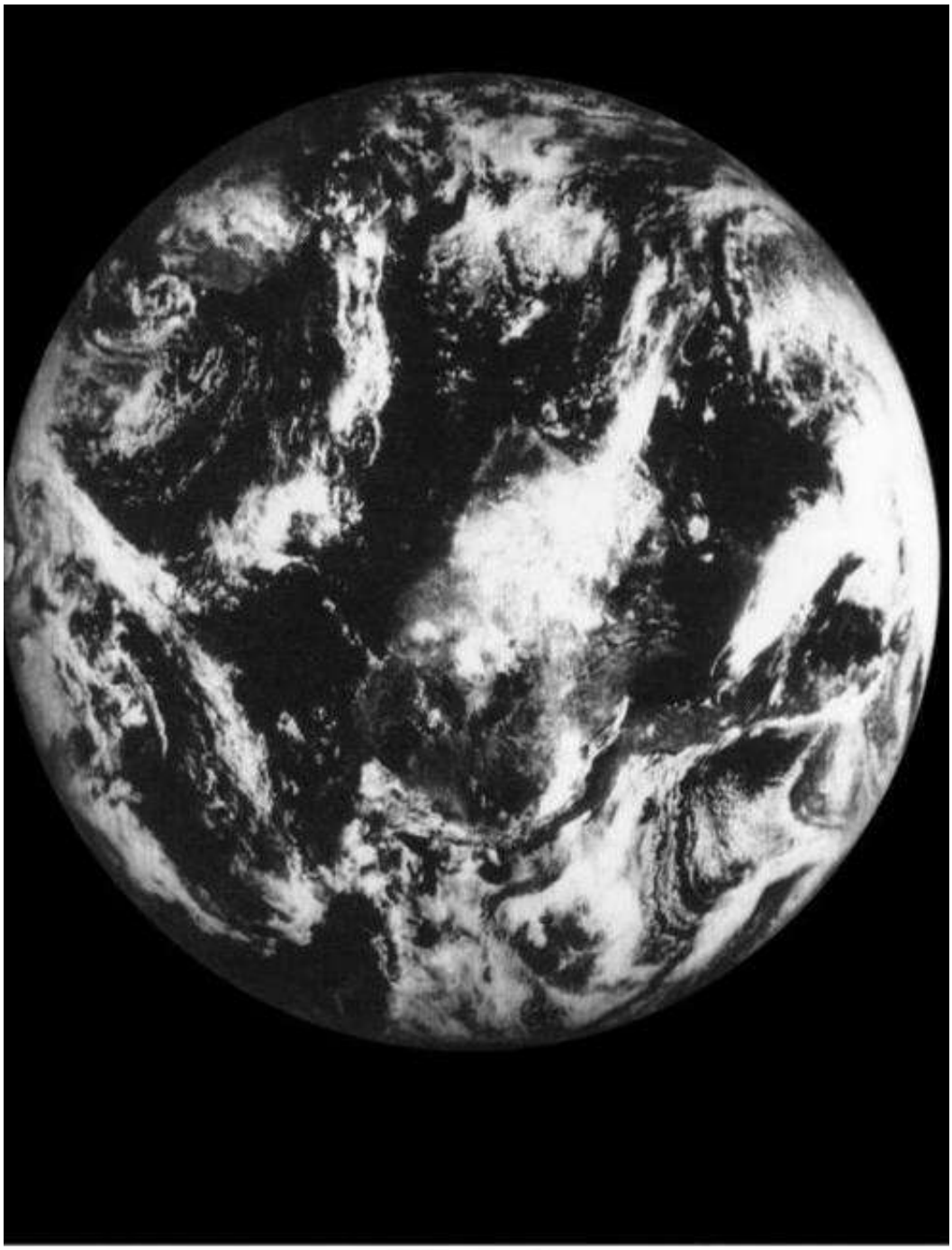

Plate 12

ATS III photograph, 17th November, 1967
NASA catalogue numbers: S67-52145,
67-H-1552 & 67-HC-723

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Plate 13

A view of the Earth from ATS III at 50° West

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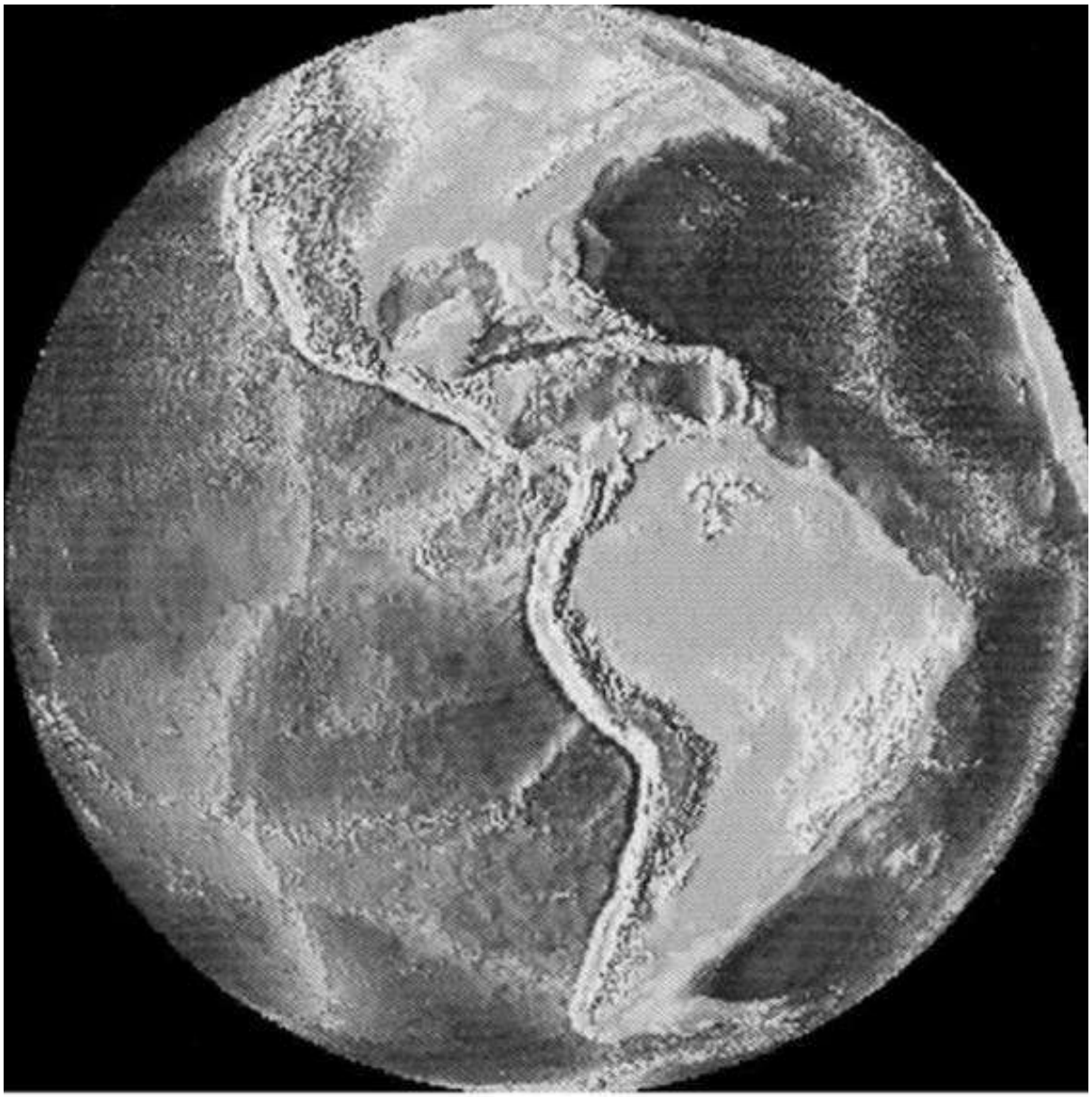

Plate 14

A view of the Earth from ATS III at 80° West

t.me/ufopediapdf

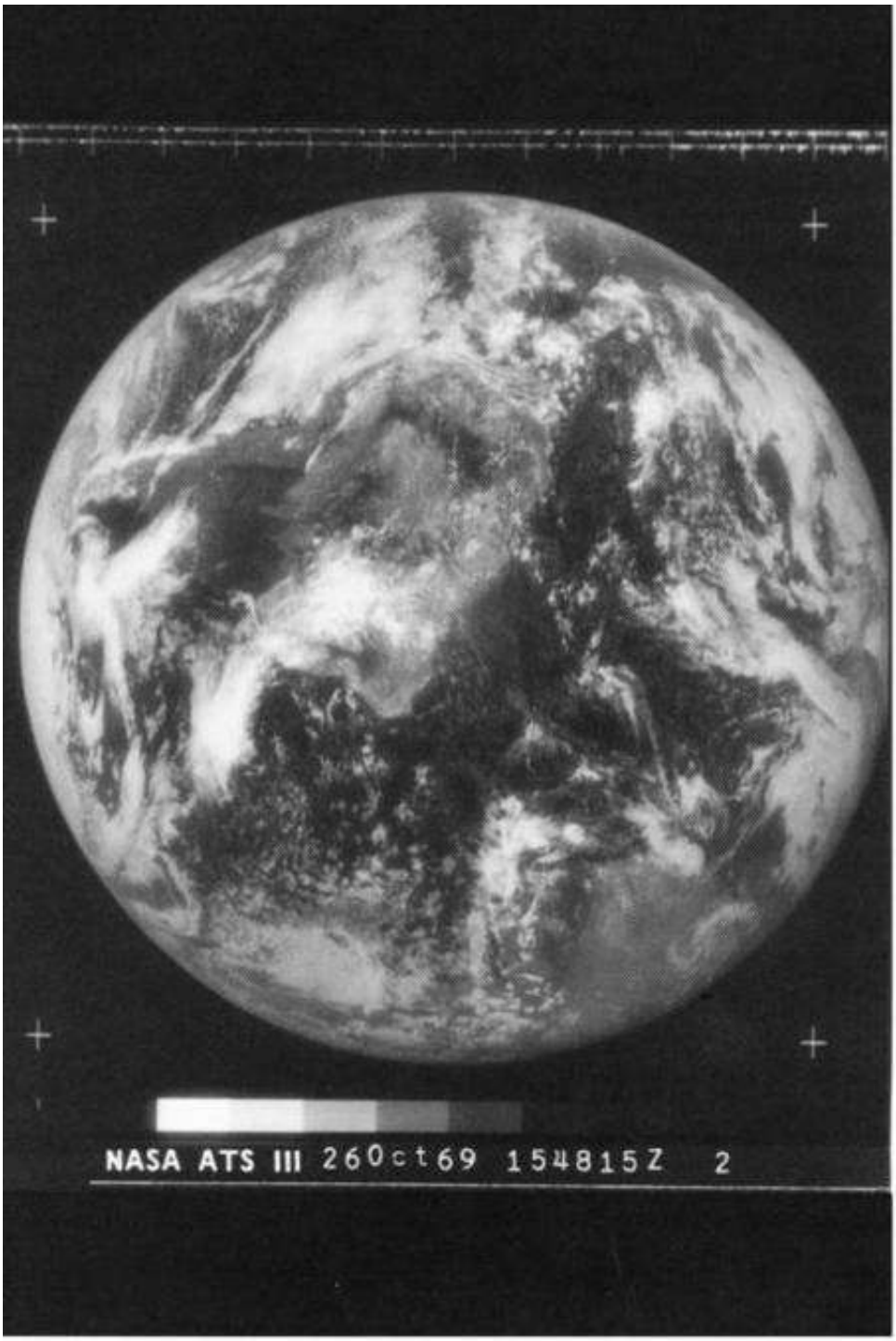

Plate 15
ATS III photo, 26th October, 1969
15H48

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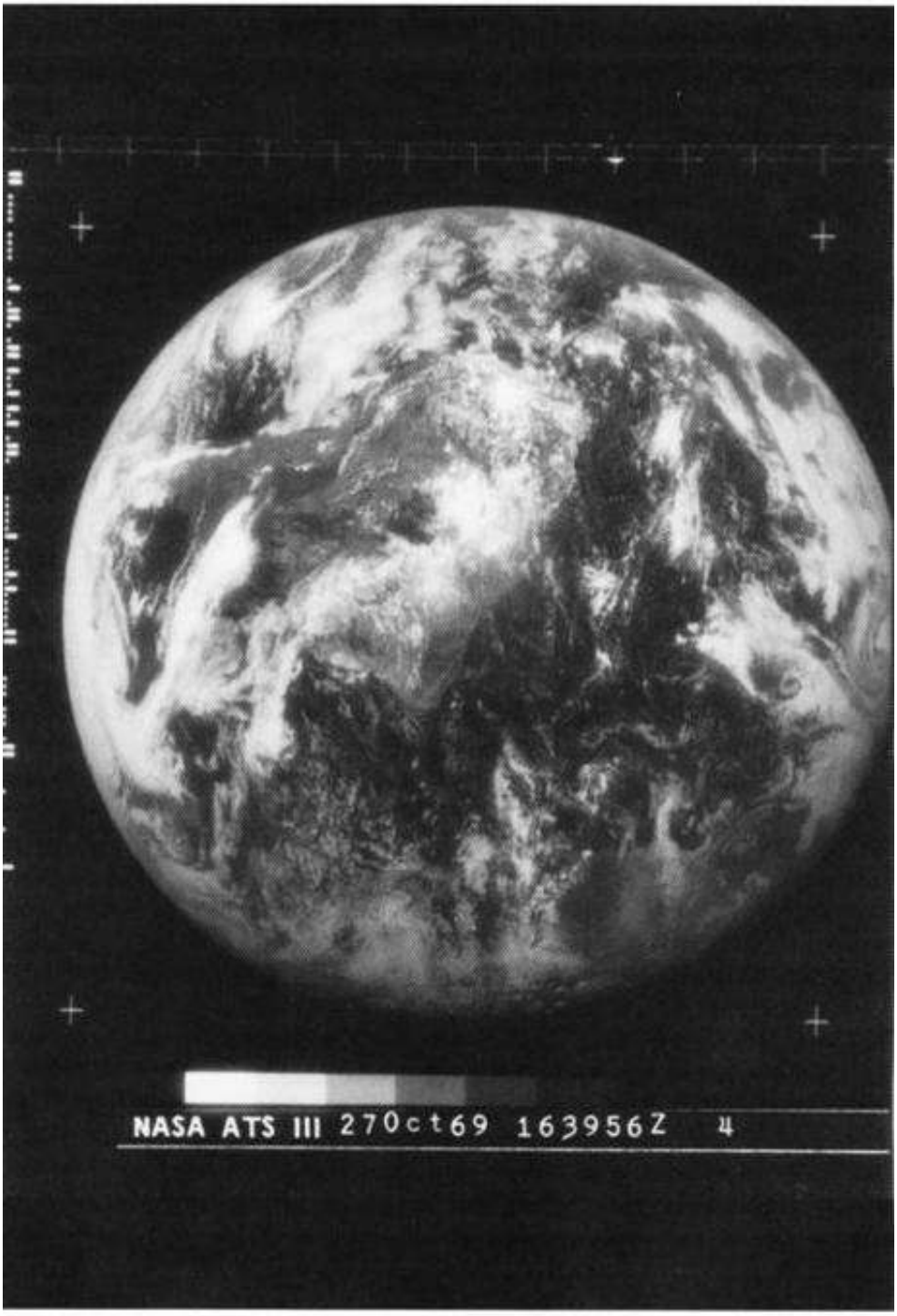

Plate 16
ATS III photo, 27th October, 1969
16H39

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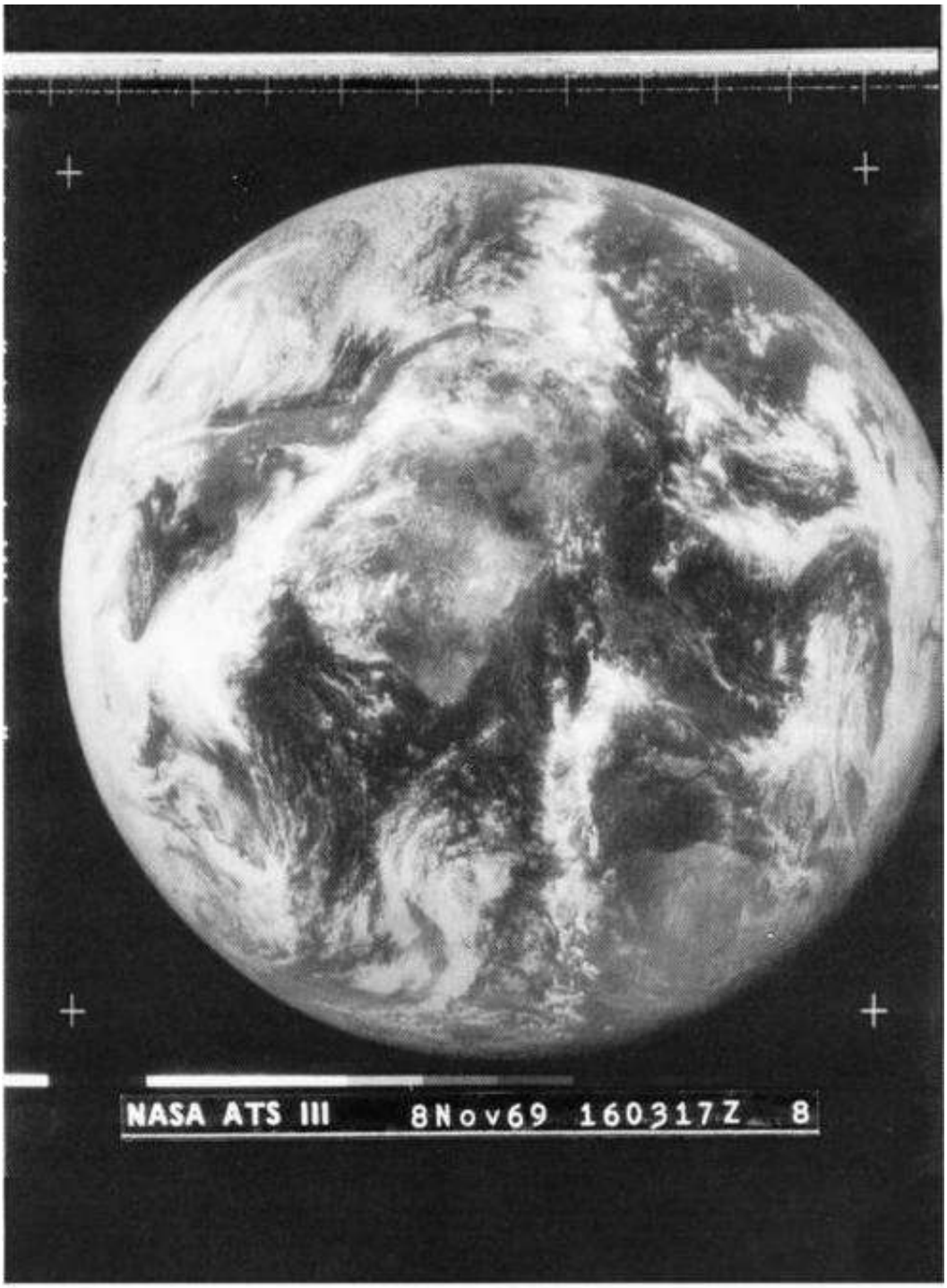

Plate 17

ATS III photo, 8th November, 1969
16H03

t.me/ufopediapdf

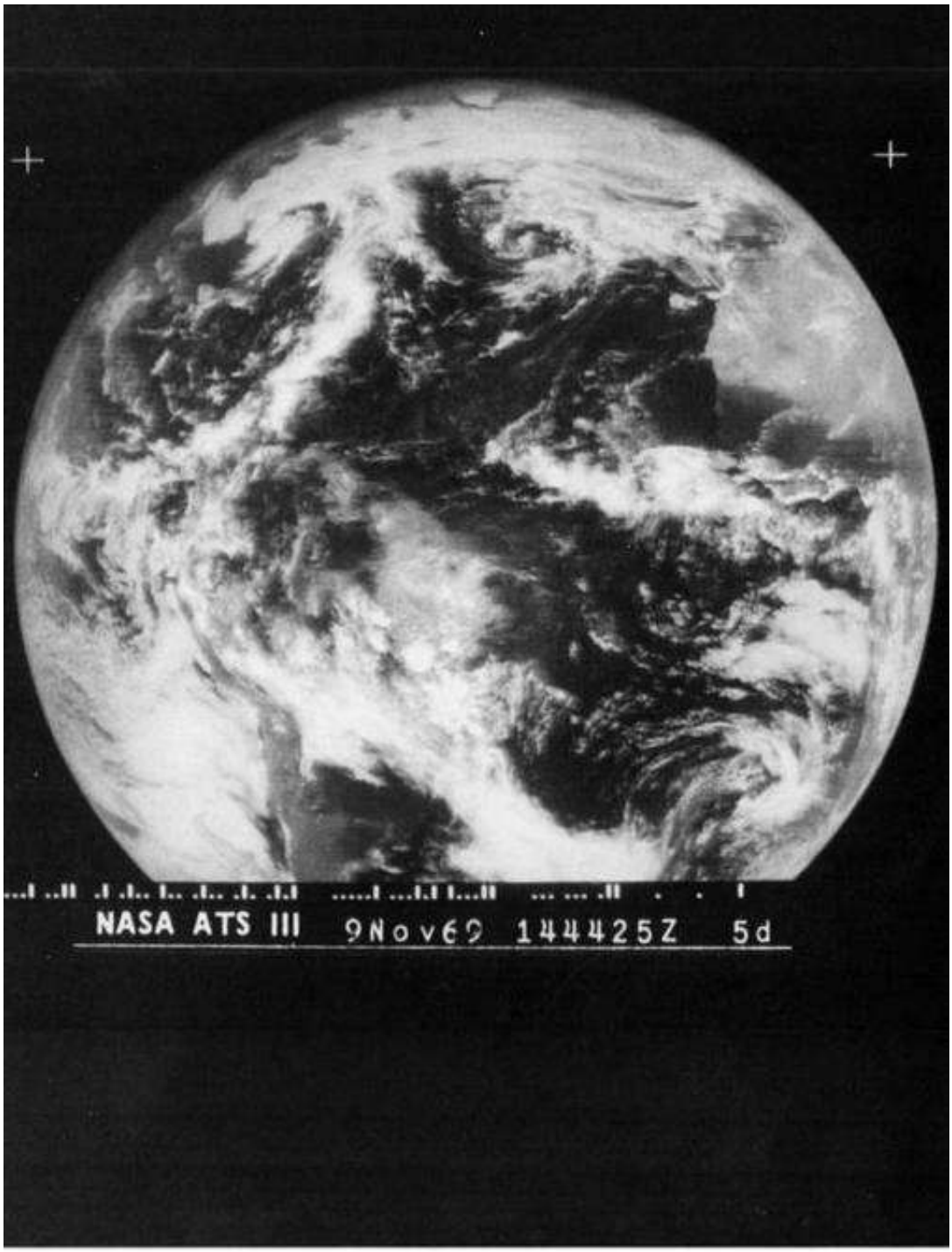

Plate 18

TS III photo, 9th November, 1969
14H44

t.me/ufopediapdf

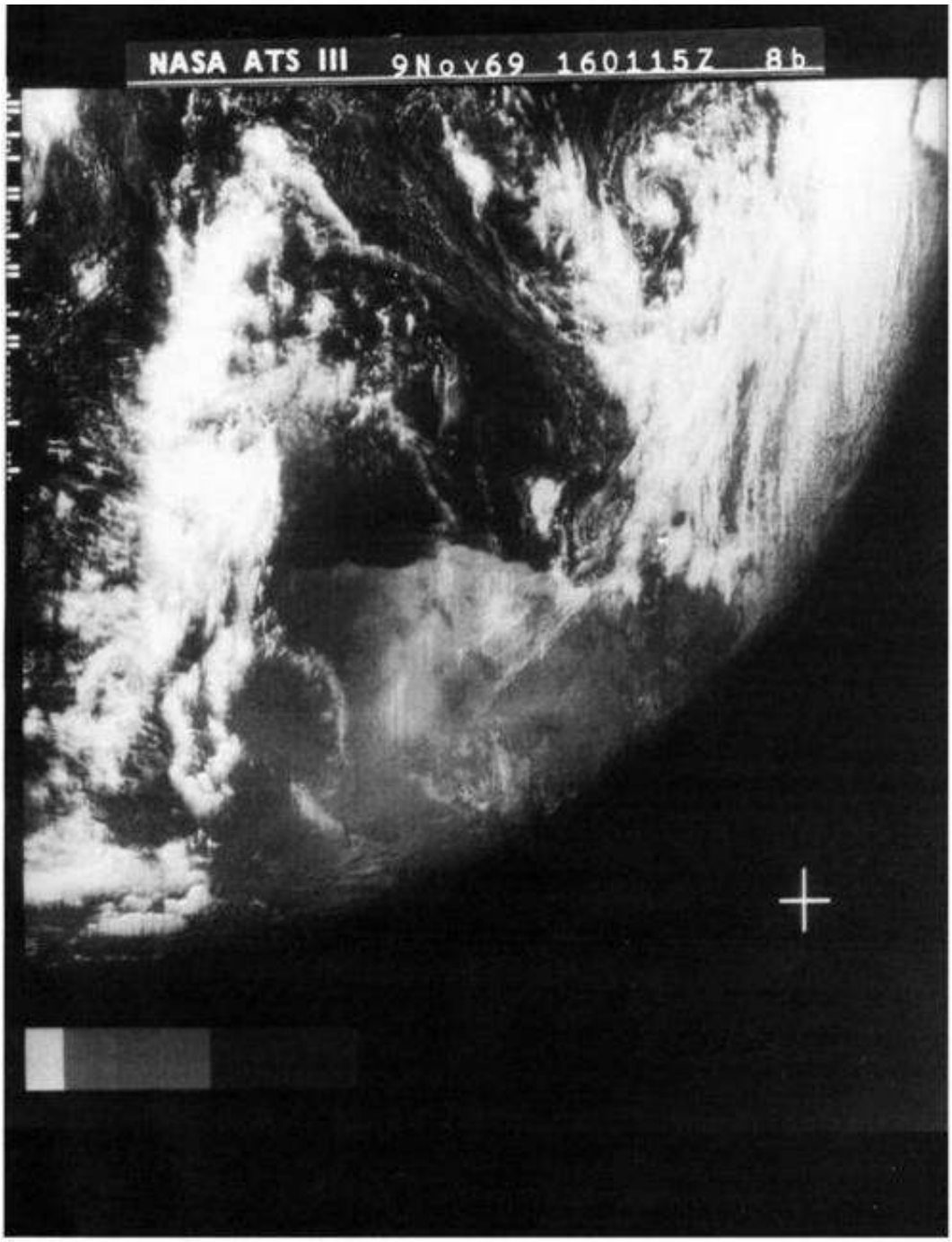

Plate 19

ATS III photo, 9th November, 1969. 16H01
Close-up view of the "Crater" shows it to be
the southern tip of Greenland.

t.me/ufopediapdf

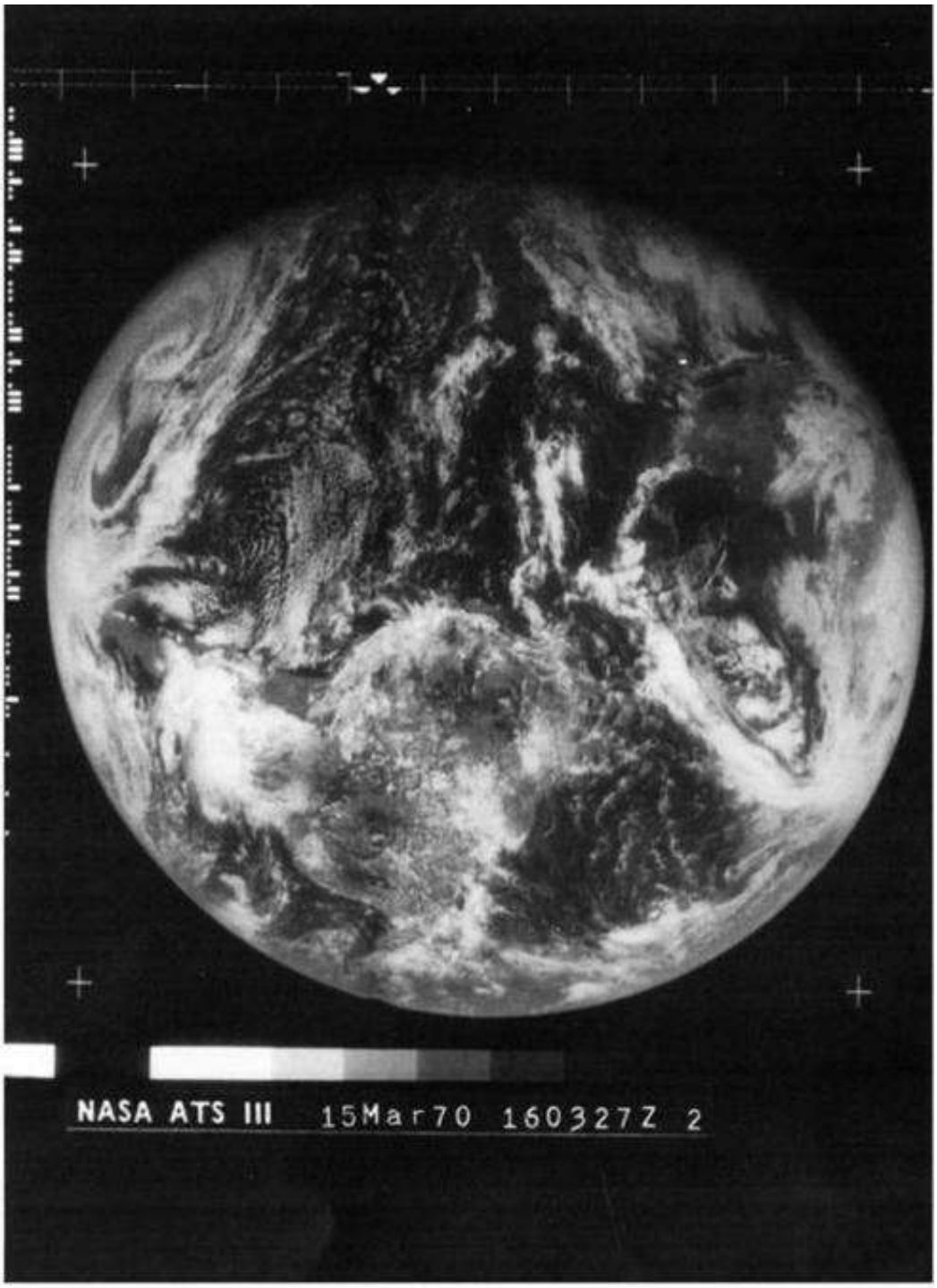

Plate 20

ATS III photo, 15th March, 1970

16H03

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Plate 21
ATS III photo, 16th March, 1970
15H54

t.me/ufopediapdf

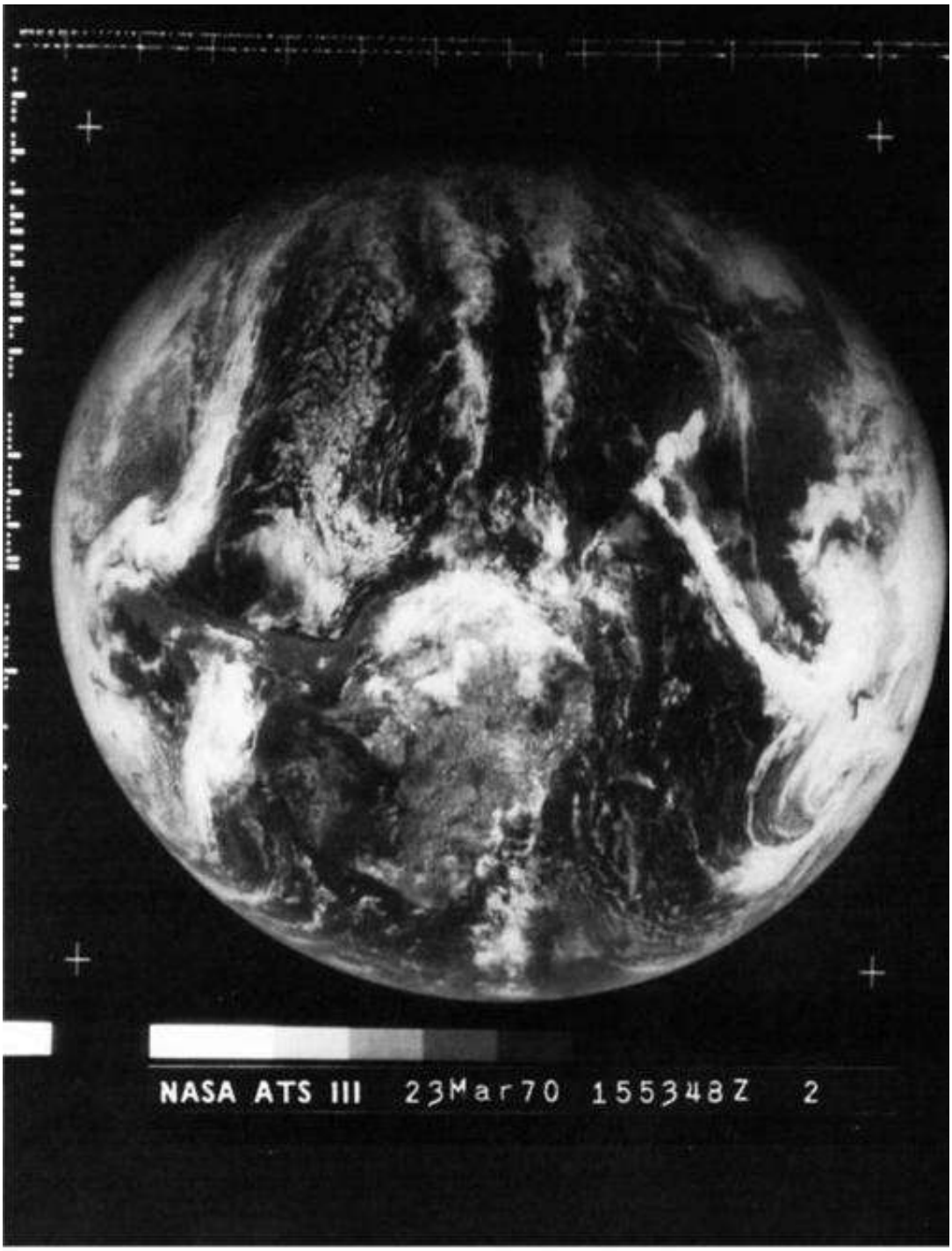

Plate 22

ATS III photo, 23rd March, 1970
15H53

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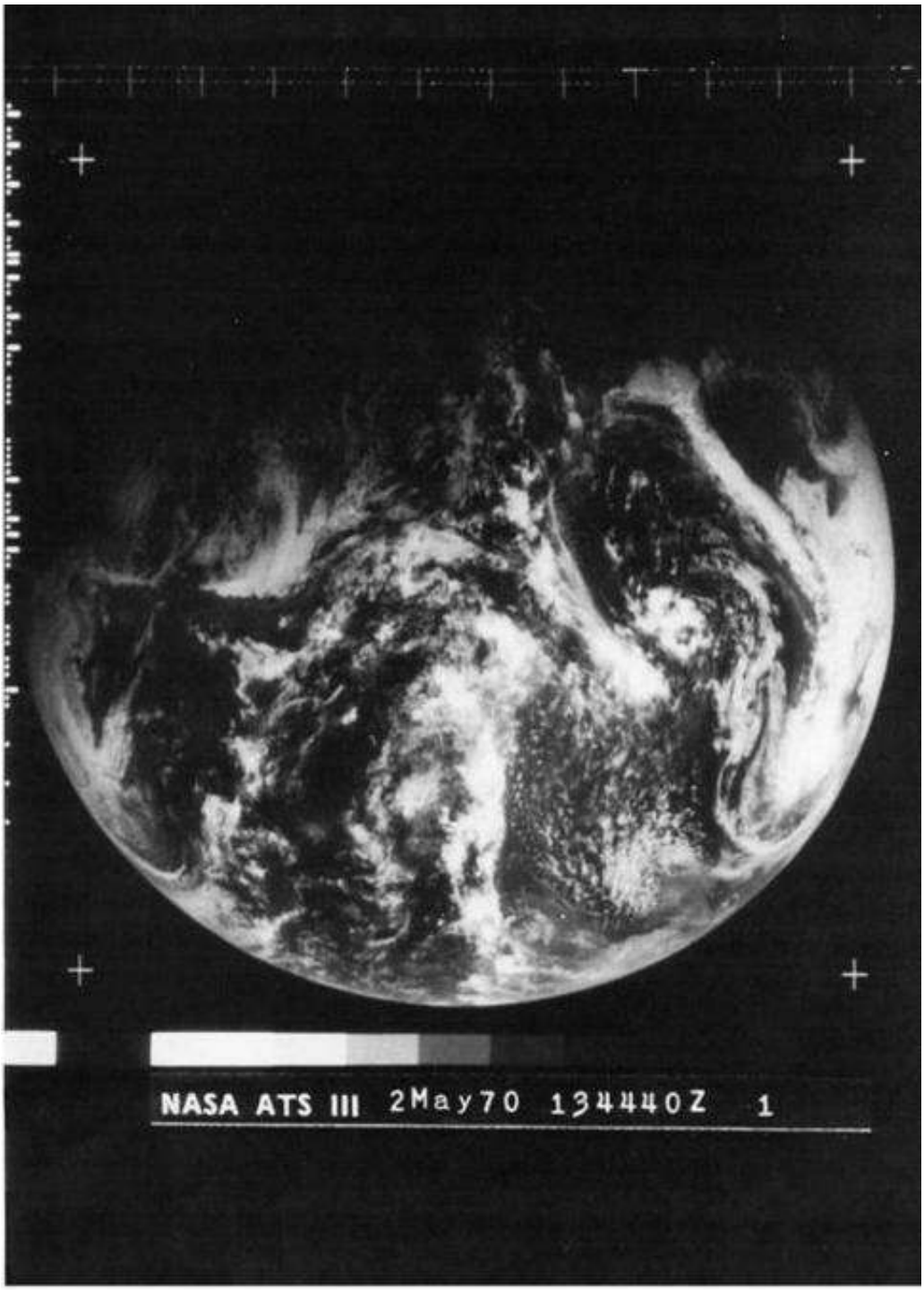

Plate 23
ATS III photo, 2nd May, 1970
13H44

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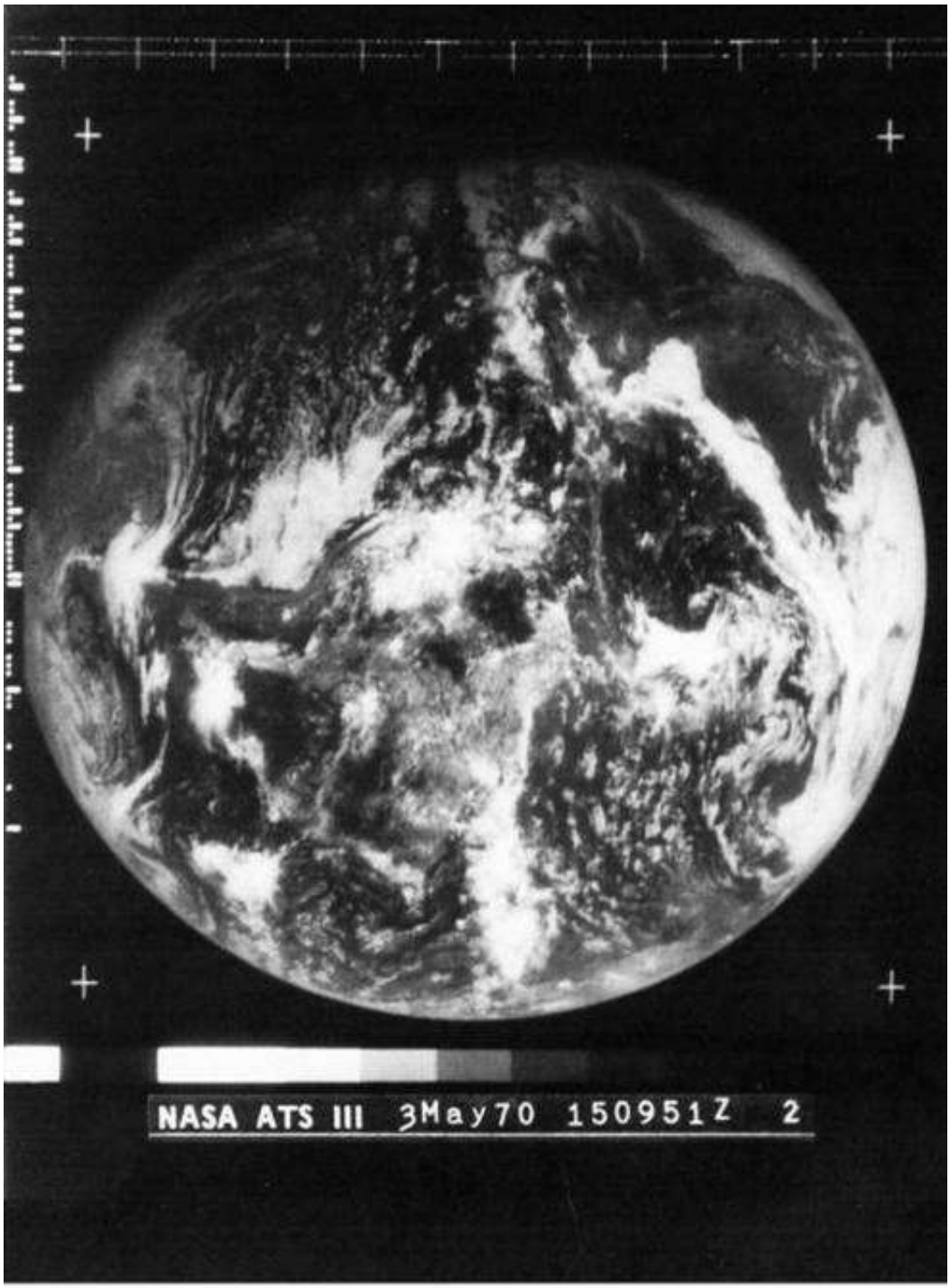

Plate 24
ATS III photo, 3rd May, 1970
15H09

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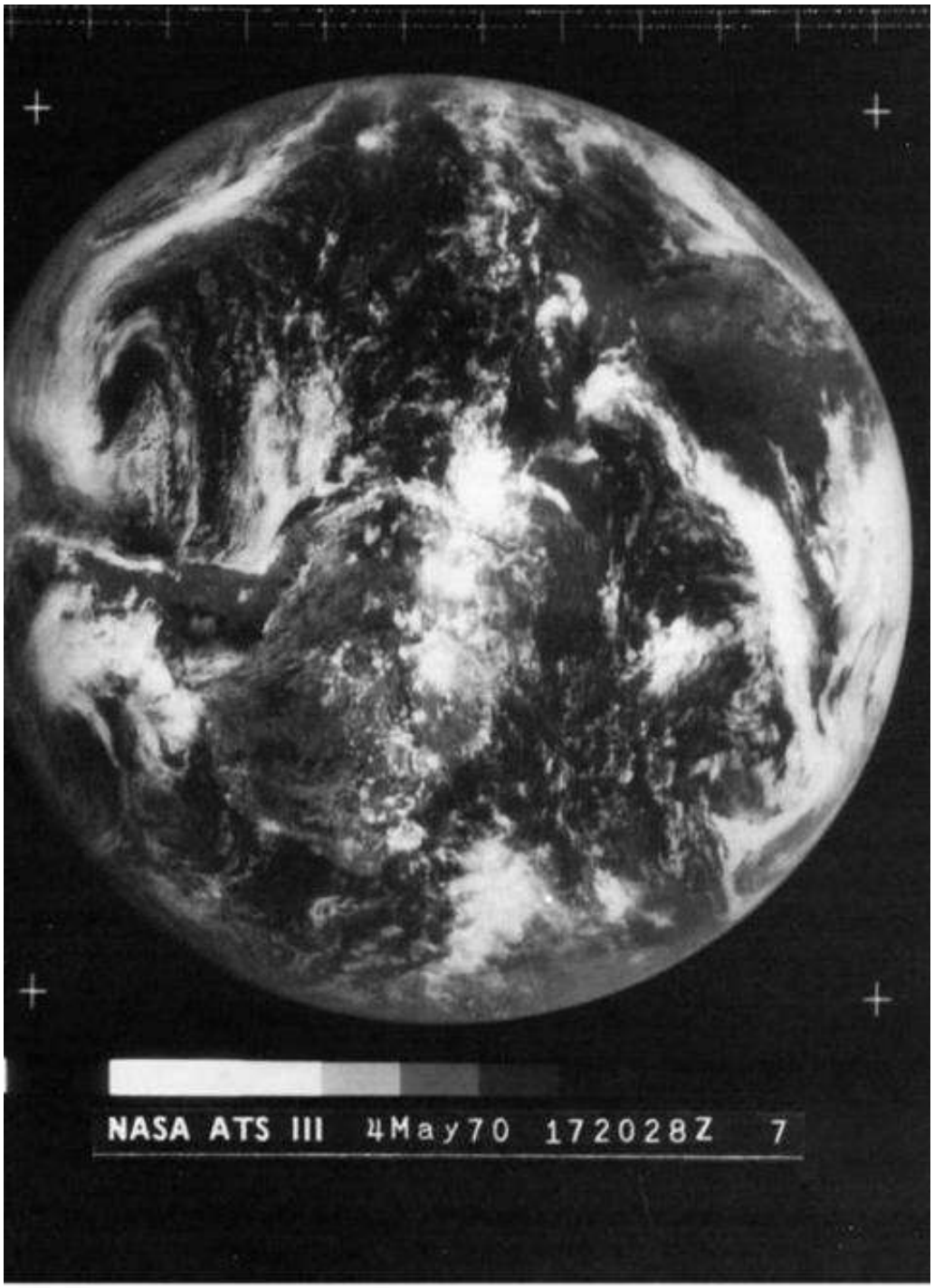

Plate 25
ATS III photo, 4th May, 1970
17H20

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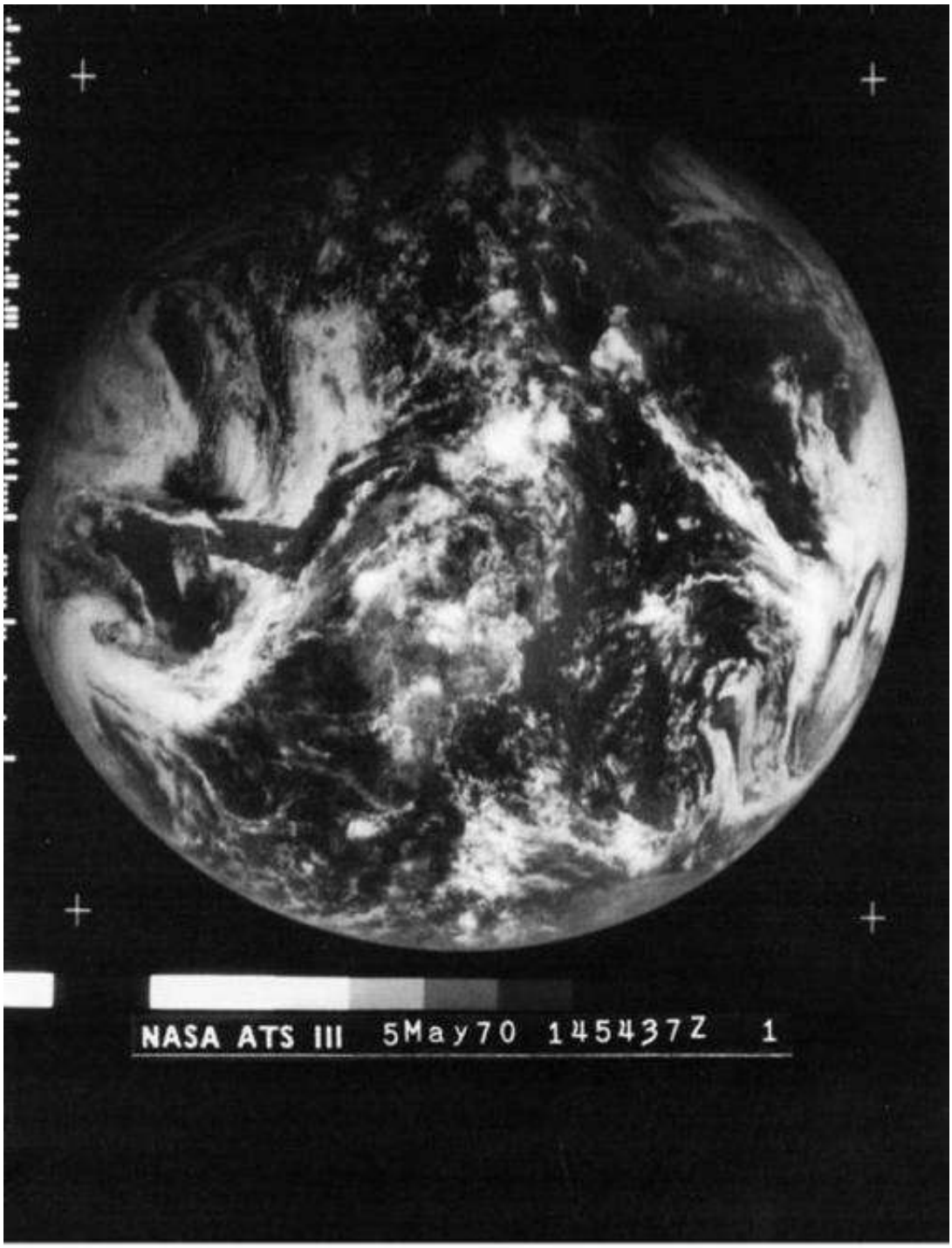

Plate 26
ATS III photo, 5th May, 1970
14H54

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Plate 27
Somerset Island, Canada. 1987
Credit: Prof. W. Lehn - University of Manitoba

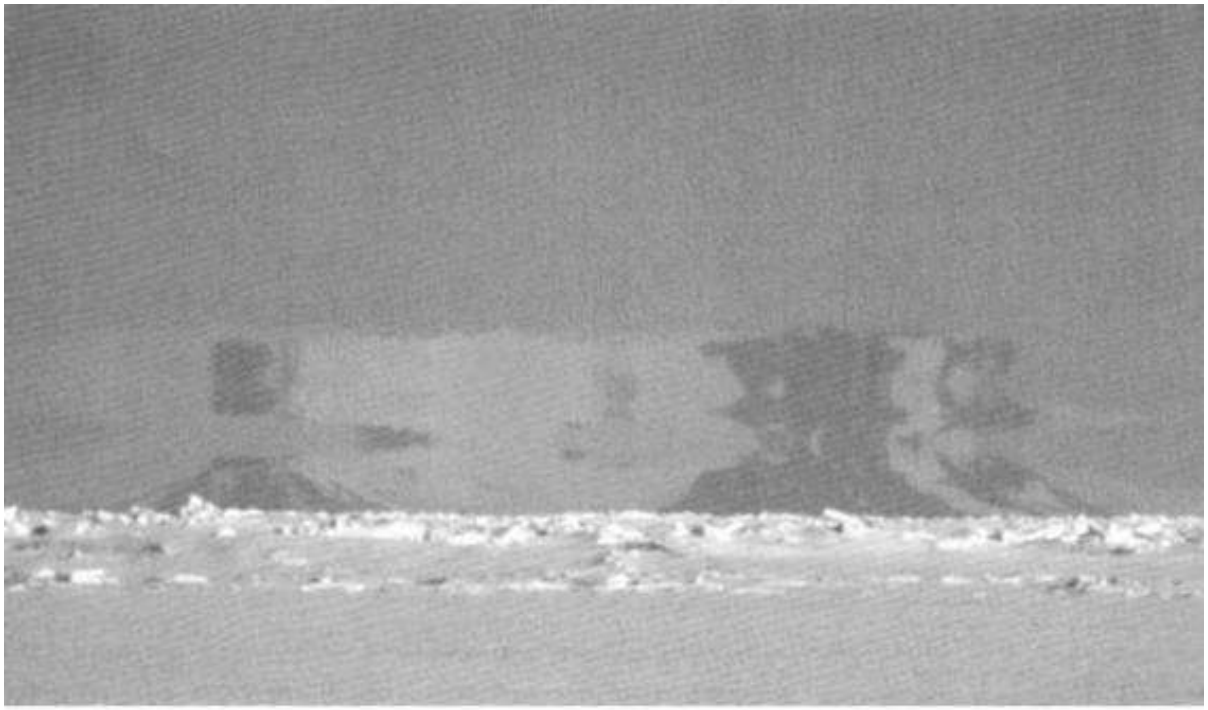

Plate 28 Mirage of Somerset Island, Canada. June 1985
Credit: Prof. W. Lehn - University of Manitoba

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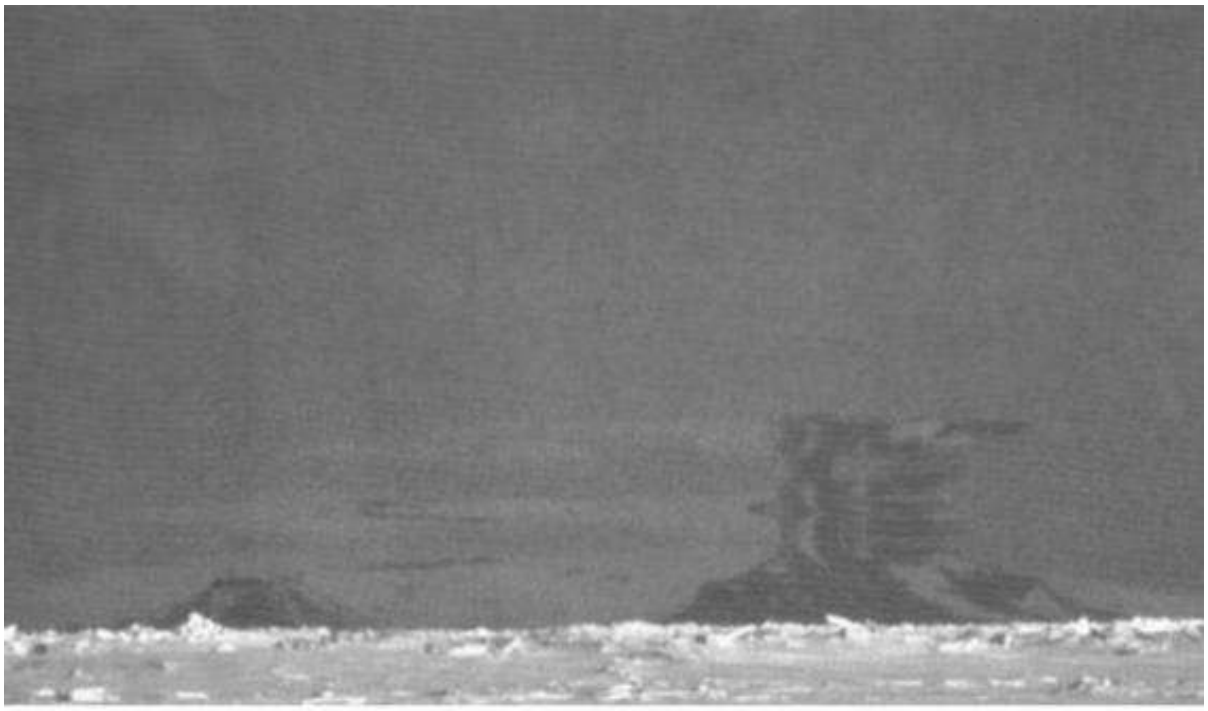

Plate 29 Mirage of Somerset Island, Canada. June 1985
Credit: Prof. W. Lehn - University of Manitoba

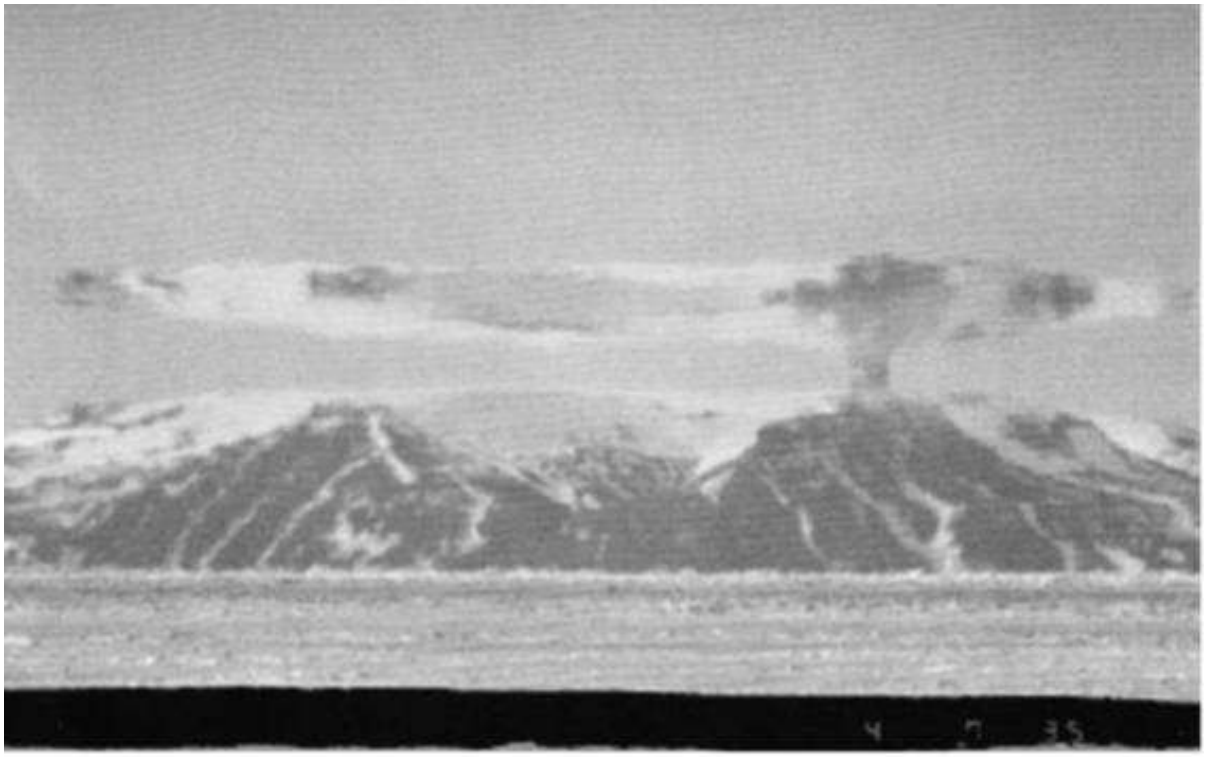

Plate 30 Mirage of Somerset Island, Canada. 4th June, 1994
Credit: Prof. W. Lehn - University of Manitoba

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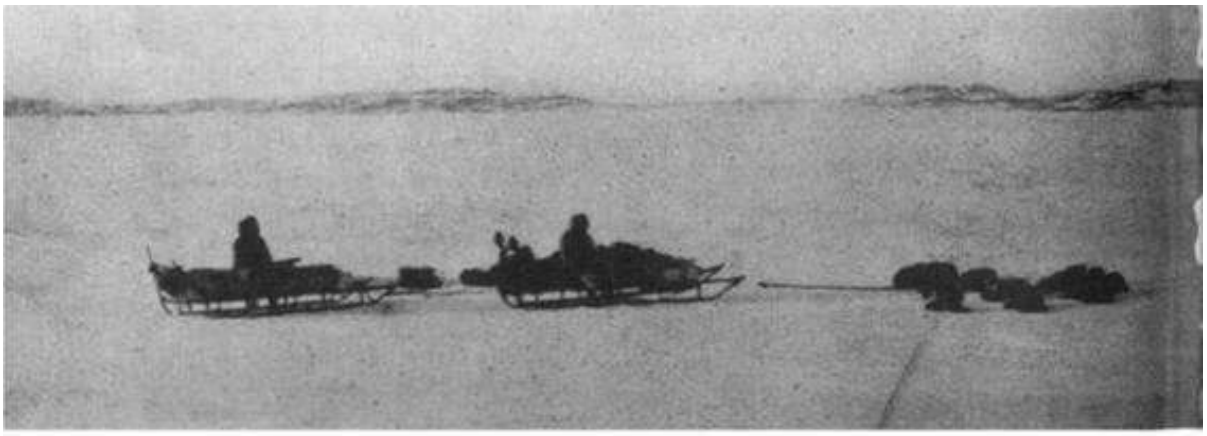

Plate 31
Dr Cook's photograph of Bradley Land. March 1908
Credit: Cook Society

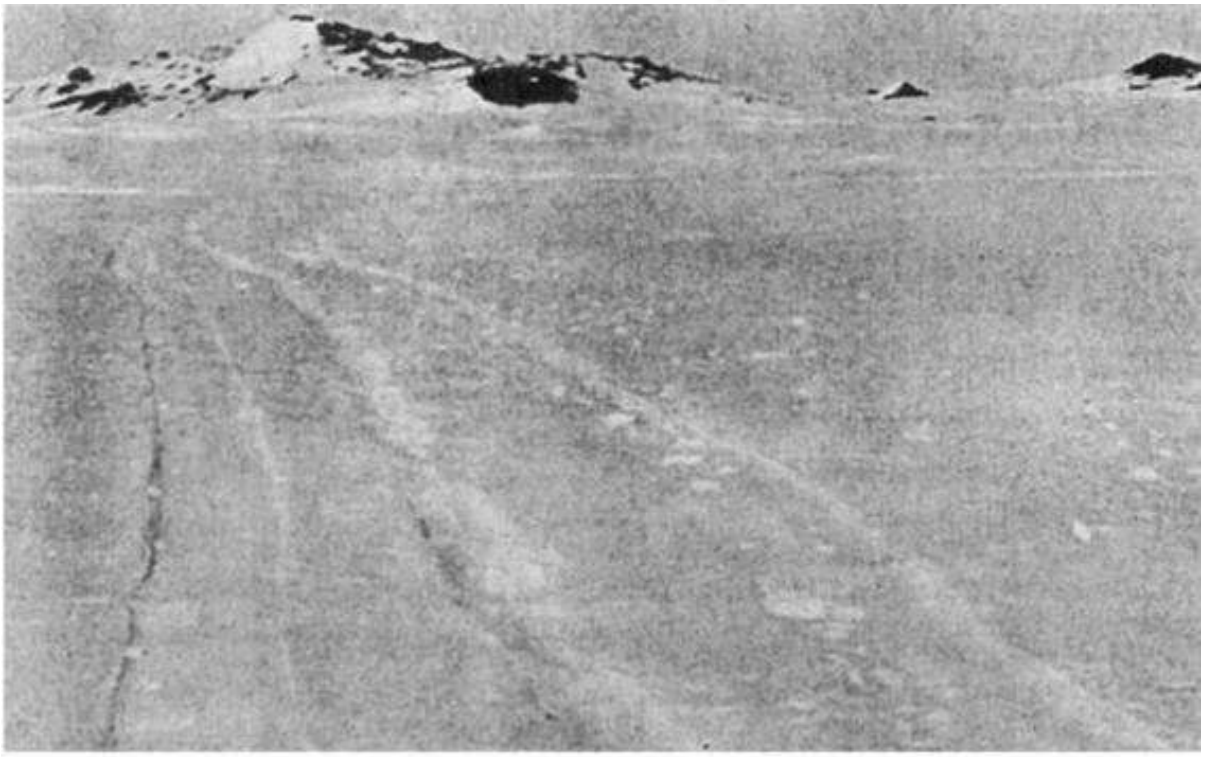

Plate 32 Arliss II. 23rd May, 1961
Credit: *Polar Priorities*; Page 26, Vol. 17, 1997

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